FOOD MANUFACTURE

Incorporating Food Industries Weekly

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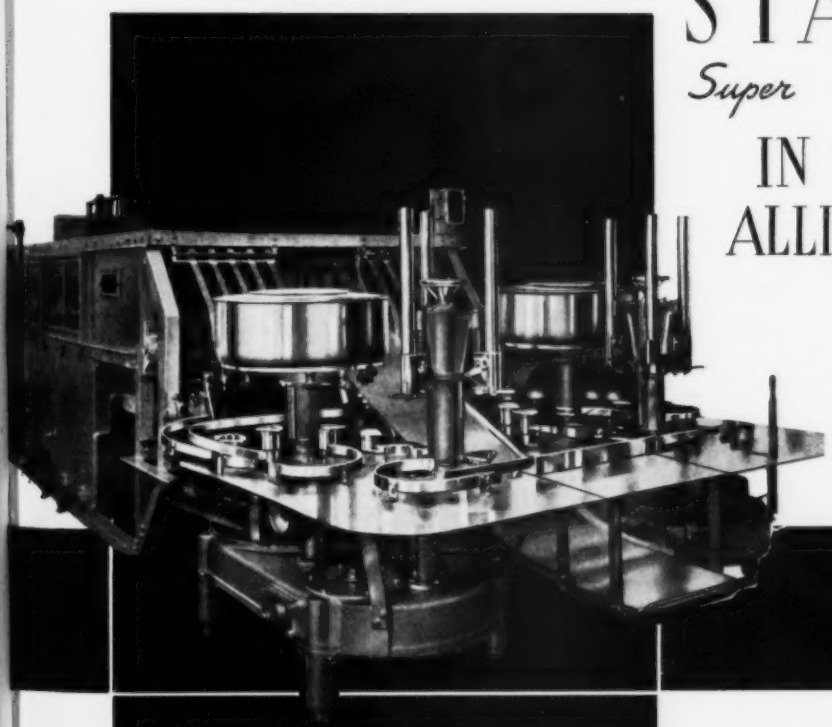

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FOOD MANUFACTURE

Vol. XVIII, No. 8 August 1, 1943

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The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

Father of Nutrition Science

THE bicentenary of Lavoisier's birth on August 26 is just as much a prominent date in the history of food science as in the history of pure chemistry. For the very foundations of nutritional knowledge were laid by this philosopher in conjunction with his countryman (Laplace) in those famous experiments on metabolism at the Arsenal Laboratory. In *La Transpiration des Animaux* and in other works it is possible to follow the efforts of this versatile Frenchman: his use of calorimeters improved by Laplace and himself; his studies of the oxygen used up and the carbon dioxide evolved, first by guinea pigs and then by human beings.

Lavoisier argued that "combustible materials" must be derived from food. "In respiration it is the substance of the animal, the blood, which supplies the food. If the animal did not receive habitually from food what it loses by respiration, the lamps would soon run short of oil, and the animal perish, as a lamp goes out when its fuel is exhausted."

Lavoisier was enabled to study man in his nutritional experiments because of the willingness of young Seguin to have any experiment, however laborious or disagreeable, performed on himself under test. With an air-proof brass mask the oxygen supply was regulated, Lavoisier noting the intake under varying activities of the "patient", the respiration with and without food, thus being able to establish the rule that the quantity of oxygen absorbed and the carbon dioxide expelled depended primarily on the factors: food, work done, and temperature of the body. Only in believing that the combustion occurred in the lungs, from which heat is carried off by the blood, was Lavoisier "led up the garden path", to use the modern metaphor. Lavoisier's chemical analyses first showed that all important foods are compounds of carbon, hydrogen and oxygen, with a special class containing nitrogen. He was the first to apply the thermometer and the balance to the study of the phenomena of life.

As a result of his discoveries and the developments which came from his followers—from men like Liebig and others who went to Paris to complete their training—we know to-day the basic food requirements of an individual just as exactly as

the engineer knows the fuel requirements of his engine. Thus do we salute the birth of that philosopher who, before the fateful days when as member of the *Ferme-Générale* he was to go to the scaffold because "*La République n'a pas besoin de savants*", studied a multitude of subjects like starch and sugar manufacture, tartar, phosphorus, salt works and sulphur springs.

Since we have mentioned Laplace, let us not forget that other helper of his, who in those studies of nutrition at the Arsenal so carefully made the necessary notes, taking her turn in taking readings by day and night and studying chemistry so that she might help him. Marie Anne Pierrette Lavoisier, daughter of Jacques Paulze of the Ferme, and so rarely acknowledged in chemistry's pages, must be included in any history of metabolism and in the tale of the happier days of a philosopher who showed that "*La vie est une fonction chimique*".

The Priority Food

Scotland's part in the production of milk, the priority food of wartime, was reviewed in Glasgow at the tenth annual meeting of the Scottish Milk Marketing Board. The atmosphere, tenor, and duration of this meeting were in sharp contrast to the first gathering of producers registered with the scheme, whose roll comprises 8,000 farmers in the area from Angus to the Solway.

Launched in the year in which Hitler came to power in Germany (1933), the English and Scottish milk marketing schemes were studied closely by the Nazis, who realised that national marketing schemes for milk and for butter would have to form part of their food defence system when they set out for world conquest. The first "lesson" learned by the Nazis from the British milk marketing schemes was characteristic—when they embarked on their milk and butter organisation in Germany they suppressed direct sales from farmer to consumer so as to obviate the "levy" troubles which were then uppermost in the British schemes.

The chairman of the Scottish M.M.B. left present troubles (such as price disparity) in the background at the meeting while he elaborated a series of claims in which the producers take pride. These milk schemes have "killed the myth that producers cannot co-operate"; they have put milk production on a more even keel than any other branch of farming, and their existence when war broke out provided the Government with a framework that had concurrently raised production and provided a machine for mobilising the nation's milk supplies upon the priority principle of distribution, which is one of the chief features of Lord Woolton's milk policy. The free and cheap supplies offered under this scheme absorb four-fifths of the Government's present milk subsidy of £14,000,000 a year.

The Board's chairman hopes that the public will not suppose that this is a subsidy to producers, as it is expressly used to lower retail prices. Under the influence of this policy the Government have induced an increase of 30 per cent. in total liquid demand. More surprising is that non-priority demand has expanded by 10 per cent. The winter stringency is due to these new factors in consumption and not to any fall in production.

Infected Duck Eggs

The danger incurred in eating unsterilised duck eggs was emphasised recently by the death of a man of 67 from acute food poisoning within 24 hours of eating a supper of fried duck eggs and milk and cornflour pudding. The infection was found to be *B. enteritidis* of Gärtner. The source of the supply of eggs was traced to a rural area and the ducks in question were isolated. The eggs from the individual ducks were examined and one yielded a pure culture of the above-mentioned micro-organism. At the inquest one pathologist stated as his opinion that ducks kept out of water did not become infected. Apparently these conditions do not produce immunity, as the ducks in this particular case were kept on highly elevated land and had no access to water.

Considerable investigation ensued after the ducks were traced. Unfortunately all consignments of feeding-stuffs in use at the time had been consumed, but samples were taken from further consignments, with negative results. The water supply was also examined, with the same result.

Frying does not sterilise the egg, and it is doubtful whether a lethal temperature is reached in the centre of the yolk when the egg is cooked in water, either soft- or hard-boiled.

It is highly desirable that a warning be issued not only to the general public but to those in charge of canteens, hospital kitchens, etc., against either the use of duck eggs or to their use when insufficiently cooked.

Fluorine in Sponge Mixture

Summonses against a retailer concerning a sample of sponge mixture which on analysis was found to contain sixty parts per million of fluorine were dismissed recently at Wimbledon. The deputy public analyst said that an injurious daily dose would be one or two milligrams and $1\frac{1}{4}$ ozs. of the mixture would contain this quantity. The defendant said that the mixture was bought under warranty from the wholesalers. For the prosecution it was submitted that it was not an effective warranty, but the defence was that the retailer was amply covered by it, and that the makers should be held responsible. The prosecution argued that the warranty must be given at the time of the contract or at a subsequent date in

pursuance of the stipulation made at the time of contract, and that in this case the warranty was valueless and ineffective as a defence.

A special feature of this case was that at a subsequent meeting of the Merton and Morden Council, who had taken the proceedings, the resolution was passed: "That a report of the proceedings under the Food and Drugs Act, 1938, be sent to the Ministry of Health with a suggestion that if and when there is a proposal to amend this Act, Section 84 should be amended so that a defendant who pleads a warranty under that Section shall be under an obligation to bring before the court the person by whom the warranty is alleged to have been given in a manner similar to that provided by Section 83 of the Act."

The National Loaf

The recent announcement that millers have now been instructed to increase the proportion of Manitoba wheats in their grist for the national loaf may offer a test in the sphere of quality. The reason advanced for the use of more Manitoba wheat is that supplies of home-grown wheat from the last crop are now exhausted.

In pre-war days both millers and bakers always assured the public that home-grown wheat is not suitable for bread-baking and that its best outlet in the bakery is for biscuits. The stresses of war, however, compelled us to grow much more home wheat in order to save shipping. As the much-expanded 1942 home crop is now used up, we may infer that the admixture of flour from home-grown wheat in the loaf in recent months was fairly substantial, as it is customary to leave home wheat in the stock till spring before it is sent to the mills.

Due to the increased rate of extraction, the present milling standard puts all wheats to a fuller test of quality. Manitoba wheat, now to be used more freely in the millers' grist, is considered to make the best flour for the Scottish loaf. Millers were asked to increase its use progressively until the end of last month. Consumers have this opportunity to study whether the national loaf improves under the increased influence of Manitoba wheats.

An admixture of 3 per cent. of oats and 4 per cent. of barley in the millers' grist continues as a means of further saving in shipping.

Sodium Nitrite in Canned Goods

In view of the fact that the present regulations in Canada (Food and Drugs Act, Ottawa, 1939) permit the incorporation of sodium nitrite in amounts not exceeding 0·02 per cent. in cured meats, including fish, shellfish, etc., and that nitrite salts are regularly consumed by those who partake of cured meats, H. L. A. Tarr and N. M. Carter, of the Pacific Fisheries Experimental Station (*J. Fish. Res. Bd. Can.*, **6** (1), 1942), have made some experiments with the view of ascertaining what effect continued oral administration of sodium nitrite in sub-lethal amounts might have on experimental animals, with special consideration of its possible cumulative toxic effect. A few experiments were also undertaken to estimate the lethal dose.

Excessive doses of nitrite have a narcotic effect on the nervous system, producing cyanosis, methæmoglobinæmia and possibly death through a process analogous to asphyxiation; but it has been stated that at least 0·2 gm. must be consumed orally in one dose to produce the mildest symptoms in adults, slightly less than this amount being tolerated safely. The authors only quote one case of a mild and non-fatal case of a German family due to the consumption of "pickled ribs".

Recent experiments by Cox and Wendel (1942) support the contention that continued oral administration of nitrite is probably not harmful. Hale (1910), however, believed that protein digestion was impaired in the presence of small amounts of nitrite, and more recently Sleeth and van Liere (1941) have stated that nitrite delays the emptying time of the human stomach. Further experimental data are needed to confirm or disprove these statements.

The authors conclude from their experiments that the growth rate and weight of certain internal organs of cats and white rats, and the fertility of the latter, are not appreciably affected by continued oral administration of sub-lethal quantities of sodium nitrite.

Lord Woolton at the Distillery

At Inverness recently Lord Woolton saw a distillery, one of many in the north of Scotland, which has been turned over from whisky production to the food services of the nation. There are now thirty-six distilleries in Scotland, mainly in the West, being used on behalf of the Food Ministry for the drying and storage of oats. Whisky-making ceased at these distilleries in March at the latest. The fact that oats and barley are now being used sparingly in the loaf—the admixture of the two cereals is not more than about 7 per cent. combined—makes it necessary that the grain should be "conditioned" before delivery to the flour mills. This conditioning process for the reduction of moisture content is being carried out at the distilleries in North Scotland, where much of the country's oats and barley is grown. Aberdeenshire normally grows about one-fifth of the Scottish oat crop. Had the distilleries not been available for this new task, special grain-drying stations would have had to be erected, which course is actually being followed in other parts of the country. Only one is being located in Scotland, as the distilleries offer alternative facilities.

Food Poisoning in a Hospital

A further "food poisoning mystery", as the local Press described it, was a recent outbreak, due to *B. aertrycke*, in a hospital. Some nurses and patients were affected and one patient died, although it was suggested that in the case of the latter the infection might have occurred outside the hospital. The cause of the infection, according to reports in the local Press, was attributed to powdered gelatine in a vanilla cream pudding. The evidence on this point, however, appeared to be conflicting, one witness stating that he did not consider the gelatine could be held responsible as there are many carriers of infection such as handling, mice, rats and cockroaches.

Attempts to trace the source of infection proved unsuccessful. Shell eggs were among the ingredients of the vanilla cream pudding, and it seems possible that duck eggs were among those used, although the hospital authorities stated quite definitely that there were none in the particular consignment of eggs used. A further complication is that it was only the nursing staff who partook of the pudding and not the patient who died, although the same micro-organism was implicated.

Happily all the staff recovered. An open verdict was returned at the inquest on the patient who died, the coroner finding that food poisoning due to *B. aertrycke* was the cause of death, and that there was insufficient evidence to determine the source of infection.

Dehydrated v. Fresh Vegetables

Fears that dehydrated vegetables may seriously menace the post-war market for fresh produce were expressed at a conference held at the Ministry of Agriculture on July 12. Dr. H. V. Taylor, Horticultural Commissioner to the Ministry, expressed the view that official control of all dehydrated supplies would be necessary after the war.

Mr. F. A. Secrett, Horticultural Adviser to the Ministry, said that the quality and palatability of these dehydrated products increased the post-war menace to the fresh vegetable market. One of the main problems that confronted the grower was to get his vegetables to distant markets in the shortest time and at minimum cost, and he felt that these difficulties would be eased if the railway companies would agree to a flat rate for the conveyance of fresh vegetables up to 200 miles.

Thirty tons of cabbages produced only one ton of dehydrated produce. Carrots and other vegetables also showed similar reductions when processed. These economies were very valuable at the present time in saving shipping space when feeding the Forces overseas; but if some of the British dehydration plants continued to function after the war the advantages of the processed products in weight and bulk would be a serious competitive factor against fresh vegetables. The British Forces overseas were also being supplied with vegetables processed in other countries, and after the cessation of hostilities these countries might consider that they had a right to send their dehydrated vegetables to Britain.

Vegetable growers throughout the country consequently viewed very seriously the post-war activities of dehydration, and they hoped that the Government would maintain an adequate measure of control over such products, both home-produced and imported.

U.S. Food Problems

The new U.S. War Food Administrator, Judge Marvin Jones, in taking office recently, expressed determination to solve America's food problems.

That the task of Judge Marvin Jones is not an easy one is stressed by a leading article by Dr. L. V. Burton, editor of our esteemed contemporary, *Food Industries*, U.S.A.

"At long last," he says (he is writing in April, 1943), "Washington is now aware of our national food problems."

Dr. Burton canvassed several branches of the industry in important production areas, and quotes at some length from the reports he received, from which it emerges that one of the troubles is that the factories are losing labour to the farmers. Factory wages are frozen at 50, 57½, and 65 cents an hour. Farm wages are not frozen. The raw materials are on hand and a large Army contract, but rates of delivery are to be cut one-third and perhaps by two-thirds.

Among the reports received is one from a West Coast canner, who states that in order to make a normal profit and furnish carrot dices on Government orders it is necessary to purchase fresh carrots at a price not exceeding $30 a ton, in face of which Army-Navy cantonments are buying at $70 to $75 a ton.

Dr. Burton fears that a grim prospect has to be faced. "Instead of increased production of processed foods in 1943 there is going to be a 10-15 per cent. decrease under the 1942 volume, without allowing for the further possible decreases as a result of bad weather during the crop-growing season." He examines the different ramifications of the problem, and is of the opinion that co-ordinated action will be months in coming. What is being eaten in 1943 is largely 1942 production, and he predicts "some real rationing in 1944".

His remedy for the situation is increased selling prices, labour prices, and farmers' prices. It is too late, he says, to do much else despite the fact that an increase of living costs will bring on a wave of strikes and set up the same problems all over again.

Fruit Drying Experiments at Ditton

Food manufacturers may be enabled to add a further string to their bow as a result of experiments in the drying of English fruits carried out by the Department of Scientific and Industrial Research at the Ditton Laboratory. This article describes the work that is being done.

SPECIALLY CONTRIBUTED

FRUIT drying experiments at the Ditton laboratory only began in 1942, and much more knowledge of the special problems appertaining to it in this country will be necessary before the scientists concerned will be prepared to recommend processing as a commercial proposition. It may be recalled that ten years' work on the problems of gas storage of fruit was performed before it was considered possible to advise growers to adopt the system. Food manufacturers must therefore not imagine that they will be able to begin drying fruit this season or even in the first season after the war, but how long it will take to enable commercial fruit drying to be advocated is problematical. A definite fact emerging from the first season's experiments, however, is that such gratifying results have been achieved, particularly in the drying of Victoria and Czar plums, Conference pears and cherries, that further experiments are to be made with fruits of the 1943 crop.

War conditions are in some degree responsible for these investigations. Imports of dried fruit amount to only a fraction of the pre-war quantities, while shortages of tinplate and sugar present difficulties to fruit canners. This combination of circumstances led the Department of Scientific and Industrial Research to investigate the possibilities of drying English fruits.

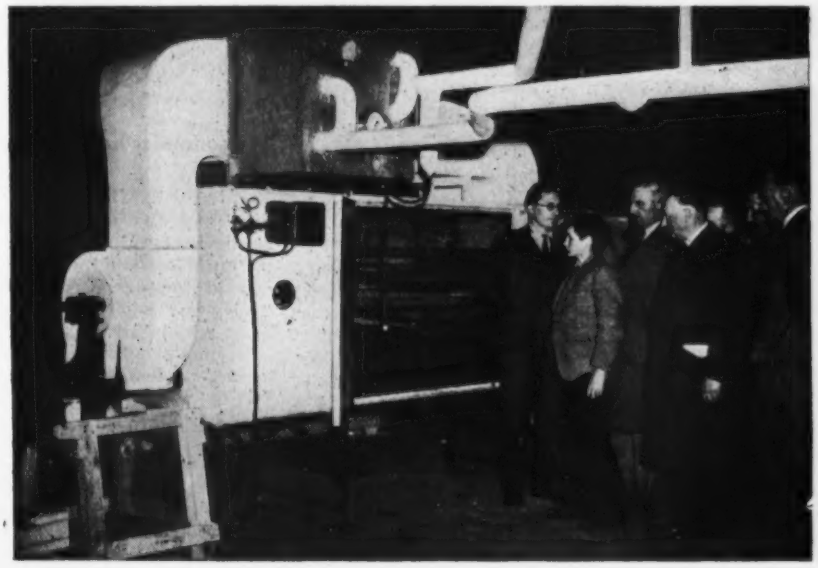
Quite naturally, the first step was to study the methods used in other countries and to ascertain the degree to which they could be applied to English conditions. In most countries drying is carried out largely by the heat of the sun, but in recent years there has been an increasing tendency to process the fruit in drying plants because of the greater measure of control this method provides. Moreover, the use of drying plants has been found in many instances to give a better product. Sun drying of fruit is, of course, out of the question in this country. The use of drying plants is therefore essential.

The processing of different kinds of English fruits requires some variation in the technique adopted, though the underlying principles are the same.

The Drying of Plums

There are two distinct types of plums from the drying point of view. Czar plums, when dried, closely resemble the familiar imported prune both in appearance in the dried state and also when stewed. Victoria plums, on the other hand, by appropriate pre-drying treatment, can be made to retain their normal colour much more closely when dried, and after being soaked overnight and then stewed are indistinguishable from stewed fresh fruit both in appearance and flavour. Similarly, greengages, damsons and Early Rivers plums may be dried so as to retain their characteristic colour and flavour when reconstituted.

A high sugar content assists both the flavour and



Members of the National Farmers' Union inspect the drying plant.

keeping qualities of the dried fruit. For this reason the fruit should be fully ripe when picked.

The fruit must be graded before processing, any immature specimens being removed. Such fruit can, however, be allowed to ripen in store at 60°-65° F. and can then be processed with later batches of fruit.

Before drying is begun, the fruit must be dipped for about 10 seconds in a 1 per cent. caustic soda lye in order to remove the waxy coating on the surface of the skin. Fruit that has been properly dipped will have a " checked " skin; that is to say, the skin will show small cracks all over its surface. This process accelerates materially the rate (and also lowers the cost) of drying. Immediately after immersion in the lye the fruit should be rinsed in cold running water, drained and then placed on trays ready for drying.

Drying Trays

Construction of the trays is important. Wood is the most satisfactory material used so far. Metal is unsatisfactory because of the risk of the fruit becoming contaminated and developing an unpleasant taste. Stainless steel trays may provide an exception, but war conditions have so far precluded any experiments with these.

Some movement of the fruit during the earlier stages of drying is desirable in order to ensure even drying and to prevent sticking to the trays. Perhaps the most satisfactory method in commercial processing would be to have the tray slightly agitated by mechanical means.

Drying is carried out by placing the trays of fruit on shelves in a closed chamber and passing over them air heated to a temperature of 70° C. (158° F.). Plums take from eight to nine hours to dry.

Sulphuring the Fruit

Plums, like most fruits, tend to darken and change in flavour while being dried. Both the natural colour and flavour of the fruit may be preserved by treating the fruit with sulphur dioxide fumes, which is done prior to the drying operation.

Plums of the Victoria type are very suitable for sulphuring; but in the case of Czar, where a prune appearance and flavour are preferable, the process is undesirable as it prevents the fruit from acquiring the attractive black lustre of imported prunes. The sulphuring process must be varied for Victorias, greengages and damsons in order to attain the desired results.

Dried plums, even after sulphuring, gradually become darker in colour and more prune-like in flavour when stored at fairly high temperatures for prolonged periods. For example, Victoria plums have been dried and stored for six months at 40°, 50°, 70° and 90° F. Samples stored at the two lower temperatures retained the original colour and flavour of the fresh fruit; those stored at 70° F. were somewhat darker in colour and more like prunes in flavour; while those stored at 90° F. were black and tasted like prunes.

Much, of course, has still to be learned about the keeping properties of dried English plums. It can be definitely stated, however, that after being stored for eight months at 40°-50° F. they are still in perfect condition, colour and flavour being retained. Dried plums may be expected to store quite well at an average temperature up to 60° F., but to deteriorate considerably at temperatures much above 70° F.

Left to right: Cooked and uncooked dried apple after six months' storage.

Apple Drying

Drying of apples has been carried out with equal success at Ditton. The fruit is peeled and cut into either the familiar rings or into " chips " of the same thickness as the rings. Sulphuring is the only pretreatment necessary, and the drying period occupies only three or four hours.

Both the finished rings and chips have a beautifully even cream colour, provided the storage temperature does not exceed 50° F. Under such conditions they have none of the brown tinge that detracts so much from the appearance of imported apple rings. The Ditton products were quite fresh in appearance even after eight months' storage at temperatures up to 50° F. and showed not the slightest sign of shrivelling or deterioration.

Cherries and loganberries also gave very encouraging results; colour and flavour were good.

Economics of Fruit Drying

Little can yet be said about the economics of commercial fruit drying. It is impossible to say whether or not the process is a commercial proposition, so much depending on the size of the fruit crop and the initial cost of the fruit. The view held at Ditton is that, however large the fruit crop in this country there is never a glut, but only local surpluses, which could be readily handled by adequate transport and other distributive services. It follows, therefore, that commercial fruit drying should be carried out in the districts where the fruit is grown.

The plant required for processing is not expensive. In the Ditton laboratory experiments a batch drier was used, but for commercial drying the continuous tunnel type would probably be used.

Costs of commercial operations would be affected to a considerable degree by the quantity of fruit available for drying and also by the question whether or not the

plant can be used for any other purpose when not required for fruit drying. In some cases existing plant that is already used for other purposes might be made adaptable for fruit drying. Where this is practicable the cost of drying may be higher than in cases where a drier is specially installed for the purpose; but, viewed as a commercial proposition over the whole year, the use of a single plant for two or more purposes at different seasons may be the more desirable. Similarly, a plant specially designed for fruit drying may be adaptable to other purposes, but the operating cost for that purpose may be somewhat higher than when a specially constructed plant is used.

About 5½ lbs. of Czar plums are required to produce 1 lb. of prunes. In America, where fruit has a lower moisture content, only 3 lbs. of plums are required to produce 1 lb. of prunes. In the case of Conference pears, 1 lb. of dried fruit will provide about 5 lbs. of reconstituted stewed fruit.

Wrapped in cellophane, a packet of apple chips about the same size as ¼ lb. of tea contains the equivalent of 4 to 5 lbs. of Bramleys. These chips are excellent for use in tarts and pies, apple rings being preferred by many people for stewing.

Experiments in the drying of small fruits are not likely to be carried out during the war. In any case, strawberries, raspberries and currants offer small possibilities for commercial drying because the quantity of these fruits available is insufficient. This is also true at present in regard to pears.

Fruit Powders

Every year, irrespective of the size of the fruit crop, there is always a quantity of windfall fruit—particularly apples and pears. In normal times this is put on the market and depresses the price obtained by growers for better quality produce. Experiments conducted at the Ditton laboratories indicate that there are strong possibilities that these windfall fruits may be manufactured into powders on a commercial scale.

Fruit of this type can be bought very cheaply, and when dried and ground into powder there is no waste. Stalks, skin and core are used. The fruit is cut into pieces and dried in the usual manner. It is necessary, however, to remove a higher proportion of the water content than when producing ordinary dried fruit, the cost of drying being correspondingly higher. The dried fruit is ground into a powder, which, if desired, can be pressed into blocks of serviceable sizes and shapes. The colour is an attractive beige.

Fruit powders have a number of potential uses. They are quite sweet and can be used dry in sandwiches instead of jam. They can also be mixed with rather more than their own bulk of water or milk so as to form sweet spreads for use in cakes and as fillers in a variety of products. They may also be used in powder form as flavourings in cakes and other products.

There is reason to believe that the powdering of fruit may do much towards solving the growers' problem of windfalls. It has yet to be proved, however, that the manufacture of these powders is a commercial proposition and that the public and the catering trades can be induced to buy them.

It is impossible to say how long will elapse before the first commercial drying plant will be in operation, but there is reason to hope that it will not be too long after the close of hostilities.

Price-Controlled Goods Order

THE Board of Trade, after consultation with the Central Price Regulation Committee, have made the Price-Controlled Goods (Invoices) Order, 1943,* replacing the 1941 Order of the same title, which is revoked. This Order is made under Sections 13 and 14 of the Goods and Services (Price Control) Act and came into force on June 1, 1943. The new Order differs from the Order which has been revoked mainly in specifying more closely the details which must be stated on an invoice and particularly in describing the goods invoiced. Invoices must contain the folfowing particulars:

(i) the name of and the address of the principal place of business of the seller;
(ii) the name of the buyer and, if another person, of the person to whom the goods are being, or will be, sent and the address to which the goods are being, or will be, sent;
(iii) a sufficient description of the goods to which the invoice relates, and in particular the numbers or quantities thereof and also the sizes in cases in which size is a relevant factor in relation to the price charged;
(iv) the price paid or payable in respect of each item in the invoice;
(v) any discount (whether conditional or not) allowed, or to be allowed, in respect of any item in the invoice;
(vi) any delivery charges payable by the buyer in respect of any item in the invoice; and
(vii) the date of the sale of each item in the invoice and the date on which the invoice is furnished.

These particulars are in the main the same as those required by the previous Order, but items (v) (Discounts) and (vi) (Delivery Charges) are new. Further, the size of an article must now also be shown on the invoice in cases where the price varies according to size.

The Order further requires that an invoice shall show any code word, letter or number required to identify goods with any specification laid down in an Order made under the Goods and Services (Price Control) Act, 1941, or in an Order made under the Defence Regulations, and in cases where the goods are utility goods the word "utility". In such cases the word "utility" must immediately precede any specification number or letter. The invoice must also show any code word, letter or number prescribed by Directions for identifying the manufacturer of the goods. These provisions apply to all goods and not to cloth and clothing only.

The provisions regarding furnishing and preserving invoices and requiring a trader to report failure to receive an invoice to the Local Price Regulation Committee remain in the new Order as they were in the old one. The Order applies only to transactions between traders and does not require invoices to be given to members of the public not buying in the course of a business.

The Order does not apply where maximum prices are fixed by, or under, Orders made by the Board of Trade Defence Regulations, but the Utility Goods (Invoices) Directions† have been made under the Apparel and Textiles Order, 1942, laying down substantially similar requirements in respect of invoices for goods controlled under that Order. Similar Directions will shortly be issued applying to goods controlled under other Orders (*e.g.*, Pottery).

* S.R. & O. 1943, No. 604. † S.R. & O. 1943, No. 696.

Green Walnuts as a Source of Vitamin C

Green walnuts are outstandingly rich in vitamin C. It is obvious that, if possible, all available nuts should be used to supplement our vitamin C intake and this article describes how this might be achieved.

L. H. C. BARTON, B.Sc.(Lond.), F.I.C.

GREEN walnuts head the list of products in their vitamin C content, as is shown in Table 1. There is considerable variation in the different species, and Table 2 shows that *Juglans regia* is the richest.

TABLE 1.

	Vitamin C. (*mg.*/100 g.)
Green walnuts	700-3,000
Rose hips	500-2,500*
Blackcurrant	160
Parsley	150
Horseradish	130
Cabbage (raw)	70
Watercress	60
Strawberry	60
Concentrated orange juice (M.o.F.)	220
Blackcurrant syrup (M.o.F.) ...	55

* Depending on variety.

TABLE 2.

	Vitamin C. (*mg.*/100 g.)
Juglans regia	1,460-1,800
Juglans regia var. *sinensis* ...	1,120
Juglans cathayensis	860
Juglans nigra	700
Juglans cordiformia	680
Juglans rupestris	510
Juglans mandshurica	410

According to the Russian findings[2] the very early stage green walnut contained appreciable amounts of the vitamin, but during subsequent development over a period of three weeks the quantity almost doubled. The early sample was bitter tasting and so undeveloped that kernel and husk could hardly be distinguished. As development proceeded the bitterness gradually disappeared and the kernel became distinguishable from the husk. At the maximum vitamin content the bitterness had almost gone and the kernel and husk were quite distinct. This condition existed for about a week, after which the nut began to harden and the vitamin content to fall. This drop in vitamin content was examined in this country with the results shown in Table 3.

In addition to fall in vitamin potency it will be noted from this table that the maximum vitamin content is reached in nuts picked about the end of July and at this stage the nuts have not begun to go "woody". This is the stage at which they should be picked if it is proposed to use them in the "green" condition.

Experiments have been made both on a domestic scale and commercially with the object of (*a*) preserving green walnuts as such; (*b*) preparing pickles containing green walnuts; (*c*) preparing jams containing green walnuts, with as little loss of vitamin as possible.

Green Walnuts in Brine, etc.

Probably all the green walnuts which have been preserved in the past have been preserved in brine. Samples of such nuts of Belgian origin known to be three years old yielded the following results:

Nuts ... 569 mg. vitamin C/100 grams.
Brine ... 698 mg. vitamin C/100 grams.

It will be observed that the brine had leached out much of the vitamin. This process appears to take place during the first few days of immersion, because a sample of fresh green nuts after standing in brine for eleven days gave the following figures:

Nuts ... 384-541 mg. vitamin C/100 grams.
Brine ... 402 mg. vitamin C/100 grams.

Similar results were obtained when vinegar was used as the preserving medium, though one important exception was encountered. In this case a sample of commercially pickled walnuts of a well-known brand gave the following figures:

Nuts ... 32 mg. vitamin C/100 grams.
Vinegar ... 26 mg. vitamin C/100 grams.

These results indicated that the conditions of processing had destroyed most of the vitamin.

Good retention of vitamin was found when fresh

TABLE 3.

Date.	*Weight of Specimen in grams.*	*Vitamin C.* (*mg.*/100 g.)
24.7.42	27·6	1,460
	18·6	1,800
5.8.42	40·3	970
	30·9	940
12.8.42	44·7	840
	42·5	820
19.8.42	28·2	810
	34·3	650
25.8.42	35·7	410
	33·0	400
31.8.42	36·5	510
	31·9	500
8.9.42	35·7	570
	27·6	420
*15.9.42	4·0 (nut)	9
	25·0 (outer casing)	550
22.9.42	1·5 (nut)	44
	21·3 (outer casing)	495
29.9.42	1·3 (nut)	7
	21·0 (outer casing)	445

* At this stage the shell had hardened sufficiently for the inner nut and outer casing to be assayed separately.

green nuts were preserved in syrup and sulphite solution (1,000 p.p.m. SO_2).

Green Walnut Pickles and Chutneys

Considerable success attended the *domestic* preparation of pickles containing green walnuts. Three examples are given in Table 4:

TABLE 4.

	Vitamin C. (*mg.*/100 *g.*)	*Theoretical.*	*Retention* (*per cent.*)
Plum chutney without walnut	0	—	—
Plum chutney with 10 per cent. walnut ...	80	85	94
Piccalilli without walnut	4	—	—
Piccalilli with 15 per cent. walnut ...	85	131	65
Tomato chutney without walnut	4·5	—	—
Tomato chutney with 15 per cent. walnut	90	131	69

All the pickles were very palatable.

On a small manufacturing scale, however, retention of vitamin C was found to be noticeably lower, of the order of 40 per cent. Some wide variations were experienced on assay which probably were accounted for by unavoidable sampling errors. Sweet mixed pickle and piccalilli were the products made in these experiments, and both were found to be quite palatable though the former was preferred. The dark specks of minced walnut showed up rather prominently in the light-coloured piccalilli, but in the sweet pickle the presence of walnut was undiscernible. When the products were left exposed to the air for a day or two a very noticeable darkening of the pickle surfaces took place. The darkening increased in intensity and extended downwards into the product with increased exposure. Doubtless this was due to the tannin present in the walnuts. Vitamin C was not found to be very stable in these products on storage. Pickles and chutneys are therefore not satisfactory products for incorporating green walnuts.

Walnut Jams

Some jams and marmalades containing walnuts were made domestically with very high retention of vitamin, but a certain amount of bitterness was observed due to the high proportion (up to 40 per cent.) of walnut used. This proportion was too high.

Dark-coloured varieties of jam were chosen for the small commercial scale experiments, so that the dark pieces of minced walnut would pass unnoticed. Plum and blackberry jams were prepared containing 10 per cent. nuts which had been preserved in sulphur dioxide, and a retention of 74 per cent. of the original vitamin C was achieved. The flavour of these products was considered to be very good indeed, the presence of the walnut being only just discernible. Subsequent storage showed that the vitamin was much more stable in these products than in pickles. See Table 6.

Jams are popular, and as neither the appearance nor the palatability of the dark-coloured jam is changed by the presence of 10 per cent. walnuts, it is recommended that the making of such walnut jams would be the best way of utilising the green walnuts that are available. If it is desired to preserve the nuts for subsequent jam making, they should be preserved in sulphite solution (1,000 p.p.m. SO_2). Brine and vinegar are unsatisfactory.

It is questionable whether the preserved green nuts would achieve any greater measure of popularity now than they had before the war, and, of course, nuts thus preserved would lose about half their vitamin content through solution in the preserving liquid. Unless this liquid were consumed there would be about 50 per cent. loss.

TABLE 5.

	Vitamin C. (*mg.*/100 *g.*)	*Retention.* (*per cent.*)
Blackcurrant jam ... (40 per cent. walnuts)	520	over 90
Gooseberry syrup ... (37 per cent. walnuts)	340	over 90
Plum jam ... ... (20 per cent. walnuts)	180	over 90
Orange marmalade... (25 per cent. walnuts)	440	over 90

NOTE.—*These products were not all made from the same batch of walnuts.*

Walnut Supplies

Before the war there was no green walnut preserving industry of any size in this country; nearly all the pickled walnuts were imported in brine. The English walnut crop is very variable, being determined mainly by the occurrence of late frosts in the spring. A good crop is said to occur about once every seven years. From information which has been collected it appears that walnut trees are clearly associated with the fruit-growing areas in Kent, Cambridge, Wisbech, the Vale of Evesham and Herefordshire. Other areas where walnuts are common are parts of Oxfordshire, North Bucks, Bedford, South Lincolnshire and Nottingham. They are also found in parts of Dorset, Wiltshire, Somerset and the Welsh Border counties, but are relatively few in the North of England, Scotland, Northern Ireland, Western Wales and South-West England.

Before the above information was available the total English crop of green nuts was thought to be not more than about 200 tons, but it is now believed that the total walnut tree population of the country is of the order of 100,000. It is difficult to assess the yield, but a figure of 156 lbs. of mature nuts per tree has been quoted. If the same figure is assumed for the yield of green nuts the total crop would be about 7,000 tons, containing about 70 tons of vitamin C. (Forty-five

TABLE 6.

PLUM AND WALNUT JAM.

Storage Period.	*Vitamin C.* (*mg.*/100 *g.*)
At the commencement	73·5
4 months at room temperature	70·0
4 months at room temperature followed by 5 weeks at 37° C.	58·0

million persons having a daily requirement of 60 milligrams of vitamin C would require about 960 tons of the vitamin annually.)

It is considered that 10 per cent. of walnuts is about the best proportion to use in the preparation of jam. Such a jam would contain about 100 milligrams of vitamin C per 100 grams. (Apart from blackcurrant jam, ordinary jams seldom contain more than 10 milligrams of vitamin C per 100 grams.) If, therefore, a consumer ate all his present monthly ration—*i.e.*, 1 lb. of a walnut jam—he would be consuming a daily supplement of about 15 milligrams of the vitamin. This would approximate to one-quarter of his daily requirement.

The author wishes to acknowledge the help kindly given by his colleague Dr. Magnus Pyke; by Mr. T. Macara of the British Association of Research for the Cocoa, Chocolate, Sugar Confectionery and Jam Trades; and Messrs. Vitamins, Ltd., in carrying out the vitamin assays; by Mr. H. Sarson of British Vinegars, Ltd., for supplying the domestically prepared walnut jams and pickles; and Mr. S. Back of Messrs. Crosse and Blackwell, Ltd., for making the small manufacturing scale experiments on jams and pickles containing walnuts.

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Correspondence

The Place of Scientists in the Community

TO THE EDITOR OF FOOD MANUFACTURE

SIR:—Most scientists find themselves in agreement with the pleas which are now being made that the scientific effort, so effective in the war, shall not be allowed to cease when peace returns, but shall be applied to the serious problems which will arise during reconstruction, and after. It is certain that if in this small island with its limited mineral resources we are to maintain our existing population with its present standard of living, scientific and technological research will be required on a scale not yet envisaged. Many responsible scientists, however, view with concern exaggerations which often accompany reasonable claims. From time to time statements are made by individuals or by organisations, professing to speak for Science, that if some fraction of the national income were allocated to scientific research, and if men of science were given a position of authority in the affairs of the State, the community would find itself in what is usually described as "an age of plenty". It is unfortunate that such exaggerations should be disseminated when schemes for future reorganisation are being discussed. To mislead the community as to its available resources can only foster illusions and bring disappointments which may be disastrous both for it and for Science. While we may hope that the improvement in our material comforts, which has marked the past fifty years, will be continued by further applications of scientific methods, the fruits of research sometimes ripen slowly and our material resources during the post-war period cannot be vastly greater than those we now possess. Because of the time-lag in the application of research, it is important that immediate preparation be made for reconstruction.

The claim that the scientist, as scientist, is entitled to some position of exceptional authority in deciding the policies of governments is one which cannot and should not be accepted in a democratic community. Social problems are too complex to be solved by any one type of mind. The man of science can give valuable assistance in solving problems facing a society by searching out the facts and, on the basis of the facts, suggesting remedies. He could profitably be consulted more frequently than has been the case. When, however, his advice has been given his duty *as a scientist* is at an end. No social problem can be solved solely by the methods of Science; not only material but other values are involved, and it is for the community, of which the scientist is a member, to weigh the different factors and make a decision. A scientific and soulless technocracy would be the worst form of despotism.

Yours faithfully,

ROBERT H. PICKARD,
Chairman, Joint Council of Professional Scientists.

ALEXANDER FINDLAY,
President, The Royal Institute of Chemistry.

W. L. BRAGG,
President, The Institute of Physics.

Pasteurisation of Milk

TO THE EDITOR OF FOOD MANUFACTURE

DEAR SIR,—I was delighted to read Dr. Hugh Nicol's article in your July issue, because it was only a few days previously that I understand a well-known nutrition expert had stated that any scientist who does not believe in pasteurisation is either a fool or a knave. This latter remark had left me in some doubt as to whether I am entitled to consider myself a scientist, and, if I may do this, whether I was a fool or a knave.

While there may be some reason to urge the advisability of pasteurisation for the supply of milk to towns under existing conditions, one cannot but feel that a large amount of the money devoted to pasteurisation and to advertising the advantages of pasteurisation would have been spent to far better advantage if it had been diverted to the production of tubercle-free cattle and cleaner milk.

In many country districts, one still suspects, the farmers don their smocks to keep their clothes clean, rather than to keep the dirt from their clothes from getting into the milk. Many smocks worn for milking could almost stand by the cows without the necessity of the farmers being inside them. When the milk has

been collected it is filled into churns, which are placed by the wayside on platforms in the summer sun until collected on lorries to be taken to the collecting stations. Even on the lorries the churns are not protected from the heat of the sun, but continue to absorb heat as a result of the conversion of light energy into heat.

I have no experience of conditions inside collecting stations, but have spent months studying conditions on farms in certain parts of the country. On one farm in particular I had once made the remark that I should be nervous of any milk, and the next year for my sins had not only to drink it myself but to use it for my three-months-old daughter, who as a result developed intestinal trouble, which was cured by resorting to a dried infant food.

In spite of the claim that there is no difference in the taste between fresh and pasteurised milk, my experience with my own children was that they refused to drink pasteurised milk without knowing the reason why some milk tasted "nice" and other milk was "nasty". While I have insufficient experience on the point to express any views, I have been informed by a London dental surgeon that he can always pick out those children who have been fed on raw milk as distinct from those reared on pasteurised. I can, however, state that my own children are reputed to have good teeth, even though my daughter as a babe suffered from calcium deficiency fits.

I have previously asked a question, to which no one has yet vouchsafed an answer, and have enquired whether it has been shown that bovine tuberculosis is only contracted by human beings from milk and that it cannot be conveyed from one human being to another. Surely there is no one who believes that the swallowing of a mouthful of bacteria is good for one, but rather that by swallowing minute numbers of bacteria more or less continuously immunity is thereby acquired which will enable one to resist a mass infection at some later date. In any case, when one sees babies' dummies picked up in the road, given a wipe with a dirty handkerchief and replaced in the opened mouth, and observes other general habits in the method of bringing up children, one is rather doubtful about the advantages of feeding three- or four-day-old pasteurised milk, as compared with clean fresh milk from healthy animals which has been cooled immediately.

Yours faithfully,
THOMAS McLACHLAN.

Calcium Metabolism

TO THE EDITOR OF FOOD MANUFACTURE

SIR:—In regard to Dr. Robinson's letter in your June issue, this gentleman had a right to reply to my last letter addressed to him by me in the *Lancet*, but he did not do so. It will be seen from my papers which appeared in the *Journal of Physiology* and the *British Medical Journal* that considerable human material has been used by us. However, all correspondence in the *Lancet* and elsewhere to which he contributed is irrelevant, since it relates to the fortification of white bread. As a fact, white bread was never fortified, and thus my contention all along that there was no calcium deficiency in our dietary was acted upon.

The only reason for adding calcium to flour, as has been stated officially, is the supposed presence of phytic acid in brown flour. Would Dr. Robinson state why the original proposal was concerned with white bread, which does not contain phytic acid? As late as 1937 the considered opinion of the American "Council on Foods" was to the effect that there was no good evidence that phytic acid prevents the absorption of calcium. Since that date the principal event in the controversy has been the publication of two papers by McCance and Widdowson. In their second paper, published November 30, 1942, the authors admit that the evidence of the first paper was not conclusive. It is thus admitted by the authority who is responsible for the proposal that, at the time when the Government announced its acceptance of the scheme, and subsequently when the eating of adulterated bread became compulsory, there was no valid reason for adding calcium to bread!

Let us see whether there is any valid reason at present for adulterating our bread. I have already dealt with the first paper of McCance and Widdowson in *The Calcium Bread Scandal*, and you have given a full account of this. Since the publication of my pamphlet we have been engaged in an experimental investigation of the problem.

In order to decide the point at issue, Mr. C. E. Vernon, M.Sc., A.I.C., and I have carried out the following experiment: A subject was kept on a constant calcium intake and as far as possible the same kind of diet for one period. In the second period the calcium intake was still the same, but in some instances phosphorus was added; in others phosphorus, iron and potassium. Phytic acid was excluded; but we still obtained a negative balance. Here are some examples.

N. Calcium intake 0·7 gm. constant. The last week of the first period calcium output 102 per cent. of intake. The first three days of the second period 130 per cent. of intake. Ultimately it dropped to 108 per cent. of intake.

S. The last week of the first period calcium output 78 per cent. of intake. The first three days of the second period 160 per cent. of intake. Ultimately the calcium output in the second period was 133 per cent. of intake.

The tendency, of course, is always for an equilibrium to be established, provided the experiment continues long enough. We can multiply the same experiments with the same results. There is therefore no shadow of doubt that the whole phytic acid business is a misconception owing to disregard of an elementary physiological law. The authors themselves admit now that this paper is inconclusive.

The second paper (*Journal of Physiology*, 13.11.42), which is supposed to establish the need of calcium in bread, is even less conclusive than the first.

(1) The brown bread in the experiment which is supposed to demonstrate that phytic acid prevents the absorption of calcium, and therefore the need of the added calcium, was baked with sodium bicarbonate and acid potassium tartrate "in order to avoid hydrolysis of the phytic acid". But people do not usually add these substances when baking bread. Therefore there is obviously no need for the doctored flour.

I will return to the possible action of sodium bicarbonate on calcium absorption.

(2) The absorption of brown bread from which phytic acid is supposed to have been removed is considerably less when compared with bread which has

been demineralised as well. This shows that after removal of phytic acid the calcium absorption is still considerably less in brown than in white bread. This proves that the conclusions arrived at by us were right. It is true that the calcium in dephytinised bread is better absorbed than in ordinary bread; but there are many factors apart from phytic acid which may account for the reduced calcium absorption. Like others, we found that the acid side of *p*H promotes absorption of calcium, and in our experience calcium chloride is much better absorbed than other preparations of calcium. To the ordinary brown bread sodium bicarbonate was added. To the dephytinised bread HCl was added, but at the end this was neutralised with NaOH. The authors, however, have taken no precaution to ensure that the *p*H in the two breads is the same. Again, we found that calcium is much better absorbed when given in liquid than spread on solid food. In the dephytinised bread the subjects had to drink the liquid filtrates.

Again, the chemical combination and other properties in the added minerals to the dephytinised bread was grossly interfered with by the process of demineralisation, which alone may easily account for the difference. Not an iota of evidence has been produced that phytic acid prevents absorption of calcium more than many other substances.

According to the authors, magnesium, phosphorus and iron as well—and I dare say a good many other substances—show a decreased absorption owing to phytic acid. If this contention is true, then the brown bread will have to be reconstructed by adding a good many substances before it is safe to use as food. Why was only calcium added? Large experience in many countries extending over generations suggests that brown bread is more wholesome than white. There is obviously no reason whatsoever for adulterating our bread, and scientific truth and public interest are being sacrificed for the sake of a face-saving expedient.

Yours, etc.,

I. HARRIS,

Institute of Research for the Prevention of Disease.

Food Substitutes and Adulteration

COMMENTING upon the very marked increase in the number of samples of adulterated food received from the Councils of Fulham and Chelsea, the Public Analyst, Mr. Thomas McLachlan, A.G.C.F.C., F.I.C., in his reports for the year 1942, expresses the opinion that the bulk of the increase is due to the attempts to persuade the public that they are obtaining a familiar genuine article when such articles are inferior ones being foisted on to the market; also to attempts to evade the Food Substitutes Control Order.

Mr. McLachlan refers to the mention in his last report of the fact that manufacturers of inferior products were able to pay for their defence out of Excess Profits, while Local Authorities are unable to risk expensive appeals on account of the effect on the rates. He points out that this has been clearly demonstrated recently in appeals to the High Court, which have resulted in statements from the court that the unsupported evidence of the public analyst is insufficient and that this should be supported by evidence from the public or from the trade. The main object of the Food and Drugs Act (states Mr. McLachlan) is to protect the public, because the public is ignorant of what it really expects the composition of food to be and is unable to tell from appearance and taste what is contained in them. If the learned judges had read the history of food adulteration it is doubtful whether they would have made this observation from the bench. The situation is rather different when considering the possibility of trade evidence, but it is found in general that, while representatives of the more reputable houses will often approach public analysts privately with a view to getting spurious articles suppressed, they are most unwilling to appear in court in support of their complaints.

It has further been held in the High Court that Courts of First Instance should give sound reasons why they have held that manufacturers have not exercised all due care and diligence to ensure that their products were properly described. These Lower Courts have the advantage of seeing the witnesses, who appear before them, and in other criminal cases learned judges have held that this is most important. It is usually impossible for a Local Authority to discover how many experts have been consulted by defendants, who tout their goods round to many consultants asking for certificates in their support and can eventually find someone who will help them. It is probably not appreciated either by Local Authorities or by learned judges that it is contrary to a public analyst's own financial interest to report samples as adulterated. Public analysts are generally paid a flat rate per sample, and when samples are genuine they merely perform a few routine tests. Before venturing to report a sample as adulterated they have to remember all the legal consequences of such an action, and, as a result, analyses are checked and counter-checked, records are consulted, and sometimes new methods of analysis have to be evolved or tried out. The fee which a public analyst receives from his Local Authority for attendance at court is usually less than one-tenth and probably nearer one-fiftieth the fee that defendants are willing to pay for his services, yet he is not even protected under Section 94 of the Food and Drugs Act, 1938, as are "officers" of the Authority, because a part-time public analyst counts only as a contractor and is responsible for his own legal defence in the event of an attack being made upon him.

There were several points of interest to be noted with reference to the report on the samples of foodstuffs analysed during the year. Four samples of blancmange powder and one of custard powder were condemned by reason of having been prepared with wheat flour instead of cornflour. Three samples of "dessert powder" were also reported against—they were also made of wheat flour. The use of the term "dessert powder" made it rather difficult at first, but when the Ministry of Food directed that this preparation must contain at least 80 per cent. of starch the situation was clarified and it was possible to put a stop to this attempt to evade the Substitutes Control Order.

Another case of interest was a so-called "flavour of

(*Continued on page 269*)

Temperature Control in Grain Stores

A. G. AREND

THE need for absolute temperature control in the storage of grain requires little in the way of advertisement at the present time, since freedom from damage over lengthy periods of storage depends upon it. Although temperature-testing equipment is already considered indispensable, many of the granaries and silos are only provided with devices which give the degree of heat from time to time, and not in the continuous order. It was formerly considered sufficient to ascertain this temperature at intervals of some two hours, but to-day the benefits of recording the temperature in the non-intermittent manner and free from thermometer breakage troubles is recognised.

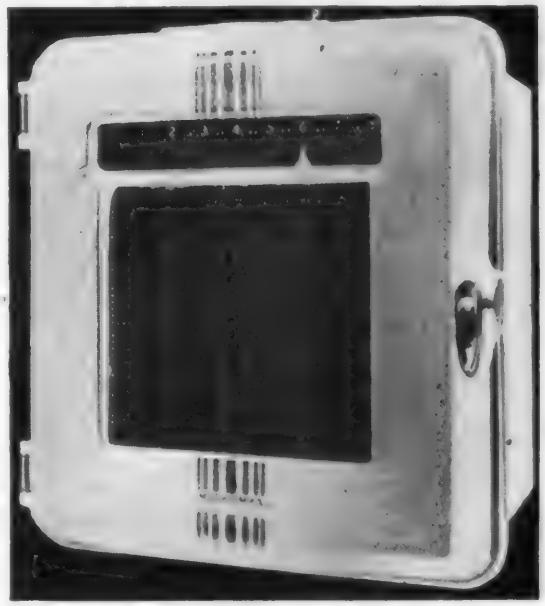
Disadvantages of Thermometers

The use of the thermometer, although still persevered with in this country, demands a certain amount of care and skill, not to mention dependence upon the diligence of the attendant if the necessary degree of reliability is to be attained.

In the earlier types of storage centres rod-type thermometers caused a few seconds to elapse while this unit was being withdrawn from the grain, after which the reading was taken, and which did not give an absolutely reliable record. The ordinary expansion thermometer can break while in position, whereby the pieces of glass and mercury become mixed with the foodstuff, and as a rule are so rapidly distributed that their removal is complicated, if not impossible.

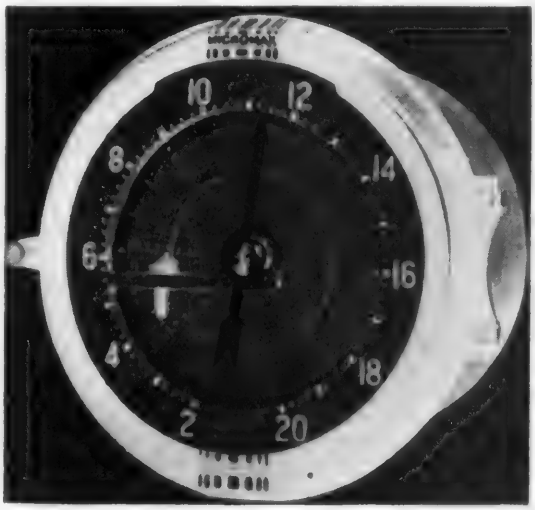
Electrical Testing Devices

The reasons for introducing different forms of electrical testing devices was not only that this trouble was entirely eliminated, but because a continuous record of the temperature was at all times furnished. It is desirable that an equivalent continuous observation of the outdoor temperature be taken in order that the supervision of the silos may be thoroughly satisfactory. For this reason a frequent practice of recent date is to have indicating sets connected to the central board mounted on a wall facing northwards at the level of the first floor. Different types of resistance thermometers have been evolved, but it is only since the war that they have been raised to a high state of perfection for silos and granaries, so that all records may be seen continuously and operated automatically from one central point.



Multiple-point recorder in which 16 different charts can be simultaneously drawn, as used in the latest granaries.

Courtesy of Leeds and Northrup Co. Ltd., Philadelphia, U.S.A.

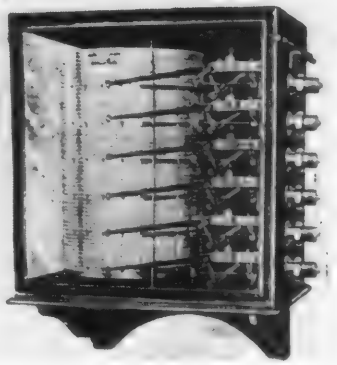


Circular chart which gives record, while large pointer can be seen from distance.

Resistance Elements

A discrimination has to be made in respect of the setting up of resistance thermometers for granaries and for silos, as the conditions required to ensure the necessary protection are different, the load imposed by the grain being substantial. In granaries the resistance units are distributed over the floor on wooden posts at a height of some 1½ feet throughout the heaps of grain, and connected to a central board. This is done either with the assistance of lines which are suitably encased, or by having the lines laid under the wooden floor.

In view of the importance attached to a slight rise or diminution of temperature, a platinum winding is almost invariably used for the internal resistance



Cylindrical charts in which 6 curves are drawn simultaneously, as at present in use with small granaries.

element, and this is so constructed that, although an outer protective steel tube is used, a direct communication of the temperature of the surrounding material is obtained.

Protection of Fittings

Despite the introduction of a wide variety of plated surfaces, the heavy nickel plating of all fittings is preferred at the present moment. The resistance thermometer is thus protected by metal, literally without interference, and gives an actual rendering of the heat, while being further equipped in the approved damp-proof manner with pressure-tight glands and boxes.

In respect of silos, as the stresses imposed by cereals are very considerable, special precautions are necessary both for the construction and the installation of the electric thermometer. Care must be taken to avoid any attachments within the silo such as cantilever frameworks or lateral supports of any kind. If this is not done the grain is liable to lose its quality to a serious extent, owing to the fact that when it falls into the chamber it will largely be broken up on striking the steel members. This relates to silos with an area of section varying between 170 and 430 square feet, and a height which varies between 45 and 105 feet.

Position of Thermometers

As a rule two thermometer locations suffice up to a height of some 60 feet, while at least three units are necessary for taller silos. In actual practice it has been found advantageous to have one resistance thermometer element located some 6' feet above the outlet of the silo, with the others more widely spaced out, whereby all troubles are readily ascertained both at the outlet and through the uppermost layers of the silo. Although for granaries the thermometers are distributed over the floor on wooden posts, no framework can be built into the silo to support them. Hence a steel tube is freely suspended in the centre of the chamber with a diameter of 1 or 2 inches, depending upon the height. In some respects this arrangement resembles the tubular mounts used for cameras, but on a more elaborate and exacting scale. Suspended steel ropes, armoured cable, and other flexible mediums might suggest greater simplicity, but it has to be remembered that heavy stresses might endanger them, and hence the tubular arrangement has proved more efficient. The minimum hold is offered to the material by the completely smooth exterior of the hanging steel tube, and in the case of smaller silos free suspension requires no anchorage, as a vertical position is always assumed. There is thus no wandering tendency such as is liable to arise with ropes, cables, or other flexible accessories. The platinum measuring resistances are inserted within this steel tube, complete with connecting cable, terminals, etc., and all protected by the one covering, whereby the possibility of external attack is eliminated. The tubular column is made up of sections of 10 feet in length, connected by a special thread, while the lower end carries a ring for accommodating a tensioning rope, so as to limit the movement of the tube with silos which are more than some 40 feet in height. In order to accommodate the column on lateral beams or for cementing into the roof of the silo, a device is used which supports it on a strong bearing, while the cable emerges immediately below the top of the suspended column and passes to the upper floor, or, alternatively, may be laid below the roof and passed to upper floors through appropriate openings. These variations have to be made in each case to suit the construction of the cells of different silos, and at a time when so much depends on reliable grain storage should not follow any one fixed, definite ruling.

Automatic, Continuous, and Simultaneous Recording

Where grain is stored on an elaborate scale, central meter sets are provided in control rooms, sometimes in groups of 20 elements, which are arranged in any predetermined order. This has been the subject of much research since the war commenced, and has been since developed in different directions.

In 1939 the usual arrangement with up-to-date silos and granaries at that time was to be content with control rooms wherein, by the turning of a handle, the internal temperatures of all silos could be periodically checked. This was a considerable advance, as it obviated the need for repeated journeys for checking purposes. To-day all records appear on the charts of multi-coloured recorders in the best approved automatic manner, so as to be immediately apparent at a glance, and without any danger of confusion. Thus with twelve cylindrical silos any change in temperature is immediately revealed through any particular curve deviating in its passage. These show the heat at the critical point at the end of each silo column where the pressure is greatest, some 6 feet above the outlet.

Other resistance elements which are located at various heights in each column transmit their record to neighbouring recorders, and, instead of having to turn knobs or handles, all charts appear automatically and continuously in groups simultaneously.

When the war commenced it was considered a great advance to have cylindrical types of charts upon which some six curves were simultaneously drawn. This, however, meant that a strictly limited area of the chart was available for immediate inspection at any one time. To-day arrangements are made whereby both light and acoustic means are used to draw attention when any one curve has passed beyond a safe limit.

One of the latest recorders of the multiple-point order, instead of depending upon a cylindrical chart, has a capacious square-sectioned panel upon which 16 different charts are simultaneously drawn, while the pens which draw them are furnished with bright con-

(*Continued on page 266*)

The "B" Vitamins

E. KODICEK, M.D., Ph.D.

Dunn Nutritional Laboratory, University of Cambridge and Medical Research Council.

IN THE early stages of vitamin research thirty years ago, the term "vitamin B" was used for a water-soluble factor in yeast which, among its other effects, protected rats kept on a deficient diet from developing polyneuritis. It soon became evident, however, that this vitamin B was not a single substance. The number of the B-vitamins increased rapidly, and with it reciprocally decreased the layman's understanding of them. In recent years many members of the vitamin B complex have been isolated, identified and finally synthesised. The story of the B-vitamins is now amenable to a systematic description.

The complexity of this group of vitamins has also been artificially increased by the different names used for the same vitamin, both here and in other countries. In this review alternative names for the various substances are given in brackets. It is, however, desirable not to use these less common terms. Another complication is that vitamin activity is expressed in varying units. It would be an advantage if agreement could be reached that vitamin concentrations should be stated in weight units. The use of biological units might be conceded only when biological methods, of a lesser accuracy generally than chemical methods, are used.

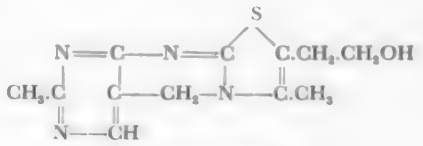
Water-solubility is the distinguishing characteristic of the vitamin B group. Table 2 shows schematically the state of our present knowledge. Aneurin, by reason of its lesser heat-stability, is distinguished from the other B-vitamins, which form the vitamin B_2 complex. The adsorbable components riboflavin, nicotinic acid, and pyridoxin represent a subdivision of this group. Pantothenic acid, *p*-aminobenzoic acid, inositol, choline, filtrate factor γ and factor W, because of the difficulty of adsorption, are classified as "filtrate factors". Biotin, being bound on proteins and liberated only by hydrolysis, forms a separate entity.

"HEAT-LABILE" ANEURIN

(VITAMIN B_1, THIAMIN, ANTI-NEURITIC VITAMIN)

In comparison with other members of the vitamin-B group, aneurin is certainly the least heat-stable. It is rapidly destroyed when heated in an alkaline medium to high temperatures, while ordinary boiling for a short time in a slightly acid medium does not generally appreciably diminish its activity.

Chemistry of Aneurin.—In 1936 R. R. Williams proposed the structural formula of aneurin (see Table 1). The structure was later confirmed by other workers and finally proved by synthesis. Its structure, involving the joining of the 2-methyl, 6-amino pyrimidine ring to 4-methyl, 5-β-hydroxy ethyl thiazole by a methylene group, is unique in nature. Many interesting properties originate from this structure. Oxidation of aneurin by alkaline ferricyanide leads to formation of thiochrome. This substance is highly fluorescent. Aneurin can be assayed with great accuracy by conversion into thiochrome provided certain precautions are taken.



Thiochrome

Biochemical Function of Aneurin.—An important advance in the understanding of the biochemical function of aneurin was the discovery of Lohmann and Schuster (*Biochem. Ztschr.*, 1937, **294**, 188) that aneurin is the essential group of cocarboxylase (Table 1). This coenzyme helps in the metabolic breakdown of carbohydrates in yeast fermentation. The rôle of cocarboxylase in human metabolism is not yet so clear, but all evidence so far points to a similar connection between cocarboxylase and the intermediate metabolism of carbohydrate.

Clinical Signs of Aneurin Deficiency.—A severe deficiency in man, rat and pigeon manifests itself as polyneuritis (beri-beri of the Far East), together with other symptoms. The characteristic lesion is a degenerative change in peripheral nerves, causing partial or total paralysis, especially of the lower limbs. But even more important is the frequent "conditioned" deficiency with resulting loss of appetite, and including symptoms of one or other of the following: cardiac disorders, œdema, polyneuritis. Several factors may be concerned in causing these "conditioned" deficiencies: (1) inefficient absorption or utilisation of the vitamin by the organism; (2) greater requirement of the organism in certain conditions (*e.g.*, pregnancy) than is provided in the average diet; (3) a deficient diet or loss of the vitamin by unskilled preparation of food.

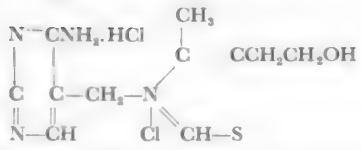
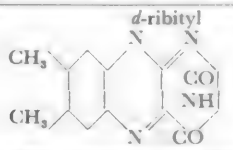
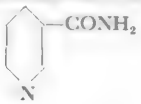
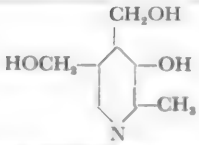
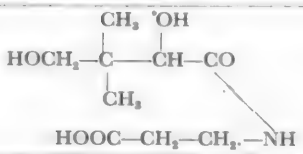
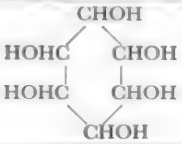
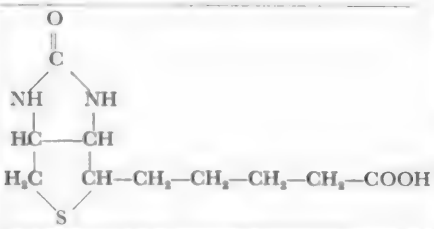
It is assumed that the minimum physiological requirement for aneurin is 1 mg. per day (330 I.U.). But others have postulated at least twice this amount as a "desirable intake".

International Units.—The international committee (*League of Nations Bull. of the Health Org.*, 1938, **7**, 882) has defined the international unit as the potency of 3 micrograms of crystalline aneurin chloride hydrochloride.

Estimation.—The estimation of aneurin in foodstuffs and other biological material is of increasing importance. Bio-assays of the vitamin were worked out long before the chemical identity of aneurin was established. Chemical methods have been developed in recent years

TABLE 1.

Vitamin-B Complex.

Name.	*Structural Formula.*	*Biochemical Action.*	*Approx. Minimal Daily Requirement.*	*Principal Sources.*	*μg. per gm.*
Aneurin chloride hydrochloride		Aneurin-pyrophosphate, carboxylation and decarboxylation	1 mg.	Yeast, dried Barley germ Wheat germ Oatmeal Pork Wholemeal bread Peas, beans Potatoes	30-60 30 15-30 9 6-12 3 3 1·2
Riboflavin		Flavin-adenine-dinucleotide, dehydrogenation	2 mg.	Yeast, dried Liver Egg white Milk	40 30 5 1·5
Nicotinic amide		Di-phospho- and Tri-phospho-pyridine-nucleotide, dehydrogenation	10-12 mg.	Yeast, dried Liver Wholemeal flour Wheat germ	500 200 30 60
Pyridoxin		Fat metabolism		Yeast, dried Wheat germ Liver Rice polishings Maize, yellow Muscle, sheep	54 16 13 13 8 4·5
Pantothenic acid		(Bios IIa) ?		Yeast, dried Egg yolk Peanut meal Liver Wheat bran Wheat germ	200 63 53 40 24 7
Choline		Fat metabolism		Liver, dried Yeast, dried	23,800 5,000
Inositol		(Bios I) ?			
Biotin		(Bios IIb) ?		Autolysed liver Molasses Egg yolk	3·9 2·1 0·4
***p*-Amino benzoic acid**		Greying of hair ?			

and are based on characteristic properties of the aneurin molecule.

(a) *Biological Methods.*—The growth method utilises the growth of rats as means of detecting the presence of aneurin in the tested material (Sherman and Spohn, *J. Am. Chem. Soc.*, 1923, **45**, 2719). The "bradycardia" method (Drury, Harris and Maudsley, *Biochem. J.*, 1930, **24**, 1632) is based on the finding that rats maintained on an aneurin-deficient diet for about two weeks show a gradual slowing of the heart rate. On administration of aneurin the heart rate returns to normal for a certain period. The length of this recovery is proportional to the amount of aneurin dosed. This method of assay gave results which were in excellent agreement with those obtained by the thiochrome method (Harris and Wang, *Biochem. J.*, 1941, **35**, 1050). A fermentation test has been developed by Schultz *et al.* (*J. Amer. Chem. Soc.*, 1937, **59**, 948) for the estimation of aneurin. It measures the amount of CO_2 formed during yeast fermentation, which is proportional to the concentration of aneurin present. Recent modifications of this method are said to render it more specific than it was previously.

(b) *Chemical Methods.*—The oxidation of aneurin to thiochrome by alkaline ferricyanide and the measurement of the fluorescence of the latter substance are the basis of most methods. Many workers have modified this procedure, using different means for the extraction of aneurin and for the removal of interfering substances. Harris and Wang (*Biochem. J.*, 1941, **35**, 1050) have made an extensive systematic study of the thiochrome method and their improved procedure has given results that agree very well with those obtained by bio-assays.

Food Sources.—Aneurin has been shown to be present in a wide variety of foods, but there are few foodstuffs of plant or animal origin which may be considered potent sources of this factor. The day's supply of aneurin has to be furnished therefore by a "mixed diet" in which several foods contribute with their vitamin content. Table 1 shows the principal sources. Whole cereals and some vegetables, like legumes, may be regarded as forming one of the more important groups for a regular supply of aneurin. Aneurin is concentrated in the germinative layers of seeds, so that the germ and the outer or branny layer of seeds are the richest source of aneurin, with the exception only of dried yeast. Refined cereals and flours are depleted of these portions and therefore contain only little of the vitamin. The aneurin content of potatoes, although not very high, may contribute significantly to the daily requirement, if large quantities are consumed. Meat on the whole is not a particularly good source, with the exception of pork. Animal organs (heart, kidney, liver, etc.) have a higher, but not an exceptionally high, aneurin content.

Processing of Food.—High temperatures, especially in an alkaline or neutral medium, destroy a great part of the vitamin. Boiling, although causing smaller loss by destruction, may extract most of the water-soluble vitamins and thus render the cooked food a questionable source of aneurin, unless the extract is served also. Little loss seems to occur during the actual canning of foods. The main destruction may occur during the preparation of the food prior to canning. If certain precautions are taken foods may be dried so as to retain most of the vitamin. Deterioration generally occurs during storage.

TABLE 2

- Vitamin B complex
  - Heat-labile— Aneurin
  - Heat-stable vitamin B_2 complex
    - Adsorbable
      - Nicotinic amide
      - Riboflavin
      - Pyridoxin
    - Filtrate factors
      - Pantothenic acid
      - *p*-Aminobenzoic acid
      - Inositol
      - Choline
      - Filtrate factor γ
      - Factor W
    - . . . . .
      - Biotin
      - Folic acid?
      - (Grass juice factor)

HEAT-STABLE VITAMIN B_2 COMPLEX

ADSORBABLE FACTORS

1. Riboflavin (Lactoflavin)*

The yellowish-green fluorescent pigment of whey was studied as early as 1879, but its connection with physiological activity was appreciated only fifty years later. In 1933 three laboratories almost simultaneously pointed out the vitamin activity of the flavin compound.

Chemistry of Riboflavin.—Kuhn and collaborators, in a series of papers, elucidated the structure of riboflavin as 6,7-dimethyl-9-(*d*, 1-ribityl)-iso-alloxazine (Table 1). The methyl groups at 6 and 7 are essential for vitamin activity, as similarly is the alloxazine constituent. The side chain of *d*-ribose can be replaced by *l*-arabinose. One of the most characteristic properties of riboflavin is its yellow-green fluorescence, which is used for quantitative assay. The vitamin is light-sensitive. When riboflavin is irradiated in an alkaline medium, the ribityl component is split off and is replaced by a methyl group. The resulting substance is called lumiflavin. It exhibits a strong fluorescence too, which provides another possibility for the quantitative assay of riboflavin. The loss of the side chain causes a change in solubility: lumiflavin is soluble in chloroform instead of in water.

Biochemical Action.—Like aneurin, riboflavin is an important constituent of enzyme systems. It forms as the alloxazine (flavin) moiety a part of the alloxazine-adenine-dinucleotide molecule. This flavin compound is the prosthetic (active) group of several respiratory enzymes. Many of these flavoproteins have been isolated from organic material and their number is steadily increasing.

Clinical Signs of Riboflavin Deficiency.—Rats cease growing and develop an atypical dermatitis and ocular lesions, when fed on a riboflavin-deficient diet. Dogs and chicks also need riboflavin. Riboflavin deficiency in man has been recognised mainly by the work of Sebrell and Butler, and of Spies. The typical signs of it are macerated areas in each angle of the mouth, which progress to transverse fissuring (cheilosis). Inflammations of the eye mucosa and other eye diseases were recently reported as one of the symptoms of ribo-

* Sometimes the terms vitamin G and vitamin B_2 are applied to this one constituent of the B_2 complex.

flavin deficiency (Sydenstricker *et al.*, *J. Amer. Med. Assoc.*, 1940, **114**, 2437).

The daily requirement is estimated to be about 2 mg. of riboflavin.

Units.—Old biological methods used the Bourquin-Sherman unit (*J. Amer. Chem. Soc.*, 1931, **53**, 3501), which equals 3-5 micrograms of crystalline riboflavin. Recent biological methods use weight units.

Estimation.—A report on the methods used for the estimation of riboflavin appeared in FOOD MANUFACTURE, 1941, 283. The fluorescence either of riboflavin or of lumiflavin, into which riboflavin can be converted, has been used for assays. The microbiological method of Snell and Strong (*Ind. Eng. Chem., Anal. Ed.*, 1939, **11**, 346) seems also to give reliable results.

Food Sources.—A good source of riboflavin is milk, which contains on the average 1·5 mg. of riboflavin per litre (Table 1). Yeast, liver, egg-white, green vegetables such as spinach, lettuce, and broccoli in decreasing order prove to be the best sources of riboflavin. Root vegetables contain only small amounts. Not much is known about the loss of riboflavin during storage. Exposure of plants to strong sunshine after cutting caused a loss of about 25 per cent. There appears to be no loss of riboflavin in meat by the ordinary household method of stewing. Roasting and frying, however, led to appreciable losses. Since it is water-soluble, the vitamin is extracted during cooking into the liquid, as are other members of the vitamin B complex.

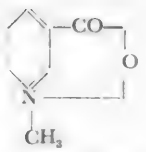
2. Nicotinic Amide and Acid (P-P, Pellagra-Preventive Factor)

Another of the outstanding advances in the knowledge of the B-vitamins was the discovery that nicotinic acid prevented or cured pellagra (black tongue) of dogs (Elvehjem *et al.*, *J. Amer. Chem. Soc.*, 1937, **59**, 1767). Very soon afterwards nicotinic acid was successfully employed in the treatment of human pellagra (Fouts *et al.*, *Proc. Soc. Exp. Biol. Med.*, 1937, **37**, 405; Harris and Hassan, *Nature*, 1937, **140**, 1070; Smith *et al.*, *J. Amer. Med. Assoc.*, 1937, **109**, 2054).

Chemistry of Nicotinic Amide and Acid.—Nicotinic acid is β-pyridine carboxylic acid. Nicotinic amide (Table 1), a substance which is found in autolysed organic material, is equally effective in the cure of pellagra, and is probably the form in which the vitamin occurs naturally.

The vitamin is extremely stable to heat, to the action of strong acids and bases, and to oxidation. When treated with CNBr, which attaches itself to the pyridine nitrogen, the ring structure is weakened and yields by fission of the ring a yellow-coloured product in presence of an aromatic amine. This reaction (König, *J. Prakt. Chem.*, 1904, **69**, 105) has been used for the assay of nicotinic acid.

Trigonelline, an inner betaine of N-methyl-pyridine β-carboxylic acid, is an inactive, though interesting, member of the pyridine group. It seems that the organism metabolises nicotinic amide to a breakdown product identical with trigonelline or a similar compound with an alkyl group attached to the pyridine nitrogen. This is then excreted, forming a portion of the trigonelline-like substances present in the urine. A further portion of these trigonelline-like substances are derived from the trigonelline taken as such in the food.



Trigonelline

Biochemistry of Nicotinic Amide and Acid.—Before the identification of nicotinic amide as the pellagra-preventive vitamin, it was already known that nicotinic amide forms the active portion of two coenzymes concerned with hydrogen transfer in the living organism. These substances are di-phospho-pyridine nucleotide (coenzyme 1 or cozymase) (3) and tri-phospho-pyridine nucleotide (coenzyme 2), which has three phosphate groups in its molecule.

Nicotinic amide—ribose—phosphate
|
Adenine—ribose—phosphate

3. Di-phospho-pyridine nucleotide (cozymase).

The pyridine nucleotides form an important link in the chain of reversible oxido-reduction reactions in living cells and are present in all animal tisues.

Clinical Signs of Deficiency of Nicotinic Amide (Pellagra).—The dog, probably the guinea pig, and man (but not the rat) develop a deficiency, when nicotinic amide or acid is lacking in food. In man characteristic symptoms appear, summarised mnemonically as the three "D's" (Dermatitis, Diarrhœa, Dementia). The resulting clinical picture is called pellagra. This nutritional deficiency is very common in certain parts of the world—for instance, in the southern parts of the United States, in Northern Italy, in Rumania, and in the Far East. But subclinical deficiencies may occur anywhere; a typical inflammation of the mucosa of the mouth (Vincent's angina), seen in this country, may possibly be aggravated by a conditioned deficiency of nicotinic amide. The clinical investigation of lesser degrees of deficiency of this vitamin is still in its infancy and it is quite possible that certain skin diseases will be found to be due to the lack of nicotinic amide.

The minimal daily requirement of nicotinic amide is assumed to be about 10-12 mg. (Kodicek, *Nature*, 1942).

Estimation.—All the chemical methods recently published for the estimation of nicotinic acid are based on the yellow colour produced when the pyridine nucleus reacts with an aromatic amine in the presence of cyanogen bromide (FOOD MANUFACTURE, 1941, 283). Many variables influence this reaction and special precautions have to be taken to obtain reproducible results (Harris and Raymond, *Biochem. J.*, 1939, **33**, 2037; Kodicek, *Biochem. J.*, 1940, **34**, 712). Microbiological methods have been developed which seem to be specific and accurate (Snell and Wright, *J. Biol. Chem.*, 1941, **139**, 675).

For assessment of the level of nutrition with regard to nicotinic amide a procedure has been proposed by Kodicek and Wang (*Nature*, 1941, **148**, 23) which combines the estimation of the urinary excretion of both trigonelline by a new method and of nicotinic amide by the method of Harris and Raymond (*Biochem. J.*, 1939, **33**, 2037; *new modification in press*), before and after test dosing with nicotinic amide.

Food Sources.—The most potent sources of nicotinic amide are yeast, liver, other animal organs, wholemeal flour and meat, in decreasing order (Table 1). Highly refined cereals are very low in nicotinic amide, which is removed by the milling process with the germ and bran. Maize, rice, egg-white and milk are also very poor in nicotinic acid. The loss of the vitamin during storage is practically nil owing to the stability of the nicotinic acid molecule. Samples of commercial yeast preparations stored for several years did not lose their nicotinic amide (Kodicek, *Biochem. J.*, 1940, **34**, 724). Any loss during preparation of food will occur only by extraction of the water-soluble vitamin into the liquid.

3. Pyridoxin (Adermin, Vitamin B_6, Eluate Factor, Anti-Acrodynia Factor, Rat-Anti-Dermatitis Vitamin)

This component of the adsorbable portion of the B_2 complex is an essential factor for the well-being of the rat and recently it has been shown that man also requires it for his metabolic processes.

Chemistry of Pyridoxin.—This vitamin, as Kuhn *et al.* (*Ber.*, 1938, **71**, 1534) have shown, resembles nicotinic acid in also being a pyridine compound. It has the formula 2-methyl-3-hydroxy-4 :5 di(hydroxymethyl-pyridine (Table 1). Its properties, however, have very little in common with those of the pellagra-preventive vitamin, either chemically or physiologically. The synthesis of pyridoxin was effected in 1939.

Biochemical Function of Pyridoxin.—Very little is known about the rôle of this vitamin in the organism. There is, however, some evidence that its action is somehow closely connected with fat metabolism. Incidentally, some of the symptoms of pyridoxin deficiency in rats, the symmetrical dermatitis, attacking particularly the extremities (acrodynia), can be cured not only by this vitamin, but also by the " essential unsaturated fatty acids " (Birch and György, *Biochem. J.*, 1936, **30**, 304).

Clinical Signs of Pyridoxin Deficiency.—It has been reported that some cases of cheilosis, described above in the section on riboflavin deficiency, can be successfully treated with pyridoxin. Psychic disorders in pellagra did not respond completely to nicotinic acid therapy, but were much improved, when this treatment was combined with injections of pyridoxin. It seems therefore justifiable to asume that pyridoxin is an essential factor in human nutrition.

The average daily requirement is not yet known.

Estimation.—Several methods were discussed recently in FOOD MANUFACTURE (1941, 283). Another method by Scudi (*Amer. J. Physiol.*, 1940, **129**, P.459; *J. Biol. Chem.*, 1941, **139**, 707) may be mentioned here : it is based on Gibb's phenolindol reaction. All the methods use the phenolic properties of the vitamin for its estimation, which, however, casts doubt upon their specificity. Biological methods have been reported by several authors; using these methods Henderson *et al.* (*J. Nutrit.*, 1941, **21**, 589) made an extensive study on the distribution of pyridoxin in meat, and Schneider *et al.* (*J. Nutrit.*, 1939, **18**, 99) and Conger and Elvehjem (*J. Biol. Chem.*, 1941, **138**, 555) in other material.

Food Sources.—Yeast has the highest concentration of pyridoxin (Table 1), then follow wheat germ, liver and other foods.

It has been reported that frying of meat caused little destruction of the anti-acrodynic activity, but roasting and stewing seemed to cause losses of from 20 to 50 per cent. (Henderson *et al.*).

"FILTRATE FACTORS" OF VITAMIN B_2 COMPLEX

(MEMBERS OF VITAMIN B GROUP THE NECESSITY OF WHICH FOR MAN IS NOT YET CERTAIN)

1. Pantothenic Acid (Chick Anti-Dermatitis Factor, Bios IIa)

In 1940 another vitamin of the vitamin B_2 complex was identified and synthesised (R. J. Williams and R. T. Major, *Science*, 1940, **91**, 246; Woolley, *Science*, 1940, **91**, 245; *J. Amer. Chem. Soc.*, 1940, **62**, 2251; and others). Pantothenic acid is a peptide-like compound composed of α-hydroxy-β, β-dimethyl butyro lactone and β-alanine (Table 1). This factor is needed by chicks, which develop in its absence a characteristic dermatitis. Rats need the vitamin for growth and the normal functioning of adrenals (Daft *et al.*, *U.S. Pub. Health Rep.*, 1940, **55**, 1333). It is a potent growth-promoting factor for certain bacteria. It is not yet known for certain whether this vitamin is necessary for human nutrition. Recent reports (Stanbery *et al.*, *J. Biol. Chem.*, 1940, **135**, 535) seem to point to the affirmative.

Estimation.—Microbiological methods have been proposed (Pennington *et al.*, *J. Biol. Chem.*, 1940, **132**, 65; Snell *et al.*, *J. Biol. Chem.*, 1940, **135**, 213; Strong *et al.*, *Ind. Eng. Chem., Anal. Ed.*, 1941, **13**, 566), involving the response to doses of pantothenic acid by *Lactobacillus casei* ε. No chemical method has yet been reported.

Food Sources.—Jukes (*J. Nutrit.*, 1941, **21**, 193) found highest values for brewers' yeast, and considerable amounts also in liver, egg-yolk (Table 1). Rice bran and wheat bran had a fair amount of pantothenic acid, while wheat germ had less.

2. *p*-Aminobenzoic Acid (Anti-Grey Hair Factor, Anti-Achromotrichia Factor, Vitamin B_x)

Ansbacher (*Science*, 1941, **93**, 164) has reported that *p*-aminobenzoic acid, known to be a plant growth-substance, is the vitamin whose lack causes greying of the hair of rats and some other animals. More recently, however, Unna and co-workers (*J. Nutrit.*, 1941, **22**, 553) could prevent greying of the fur by supplements of pantothenic acid, while *p*-aminobenzoic acid was ineffective. Very rich in *p*-aminobenzoic acid are brewers' yeast, rice bran, liver, cane molasses.

3. Inositol, Phytic Acid (Mouse Factor, Bios I)

This alcohol of the cyclohexane series has the structure shown in Table 1. Inositol is a very active growth-promoting factor for yeast (Bios I, Eastcott, 1928). Salts of hexaphosphate of mesoinositol (inositol) occur widely and in considerable amounts in plants. They are salts of *phytic acid*. In 1940, D. W. Woolley (*J. Biol. Chem.*, 1940, **136**, 113) found that mice fed on a purified diet containing the known components of the B complex ceased to grow and became hairless over the trunk. He later identified the missing substance as

inositol. Whether this finding has any significance for human nutrition is not yet known.

In another connexion, however, phytic acid has important correlations with the action of vitamin D, the absorption of calcium salts and thus with the development of rickets. According to Bruce and Callow (*Biochem. J.*, 1934, **28**, 517) the phosphorus of phytic acid is largely unavailable to the organism and thus causes a disturbance of Ca : P ratio in the diet. Recently, however, a different explanation was given by Harrison and Mellanby (*Biochem. J.*, 1939, **33**, 1660), who consider that phytic acid inhibits the absorption of Ca from the alimentary canal.

4. Choline

Recent investigations make it reasonable to include choline, at least provisionally, among the vitamin B complex. The large quantity of choline required (15 mg. of choline daily are needed by young rats : Sure, *J. Nutrit.*, 1940, **19**, 71) and the possibility of its replaceability by methionine, betaine or other substances (du Vigneaud *et al.*, *J. Biol. Chem.*, 1939, **131**, 57) may argue against its inclusion among the vitamins.

Choline (Table 1) is known to be concerned with the metabolism of fat and in the chemical process of transmethylation in the animal organism. Jukes (*J. Nutrit.*, 1940, **20**, 445) and other authors have shown that it is an essential constituent of the diet for turkeys, chickens and rats. A deficiency of choline manifests itself in hæmorrhagic lesions of kidneys and fatty degeneration of liver. Choline may be needed by man (Rose *et al.*, *J. Biol. Chem.*, 1942, **146**, 683).

OTHER MEMBERS OF THE VITAMIN B COMPLEX

1. Biotin (Vitamin H, Coenzyme R, Anti-Seborrhoeic Vitamin, Bios IIb)

It has not yet been shown conclusively whether biotin is necessary for the human being. Biotin, 2'keto-3,4 imidazolido-2-tetrahydro thiophene-valeric acid (du Vigneaud *et al.*, *J. Biol. Chem.*, 1942, **146**, 475), is necessary for the growth of yeast (Kögl and Tönnis, *Z. physiol. Chem.*, 1936, **242**, 43), and it is identical with the substance necessary for the respiration of the root-nodule bacterium Rhizobium. A biotin-deficient diet, or a diet containing large quantities of egg-white, causes characteristic seborrhœic dermatitis in rats, which was known formerly as the " egg-white injury in rats " (see György *et al.*, *Science*, 1940, **91**, 243). The " toxic " action of egg-white is due to an albumin-like substance (" avidin," Eakin *et al.*, *J. Biol. Chem.*, 1940, **136**, 80) which combines with biotin, thus making it unavailable to the organism.

The richest known sources of biotin are autolysed liver, cane molasses and egg yolk (Table 1).

2. Filtrate Factor γ, and Factor W

It seems that apart from the filtrate factors here described there are two or more additional factors in yeast found to be active by experiments on rats (Macrae *et al.*, *Biochem. J.*, 1939, **33**, 1681 ; Black *et al.*, *J. Biol. Chem.*, 1940, **132**, 65). They promote further the growth of rats, when all the other identified B-vitamins have been added to their diet.

3. Folic Acid and Grass Juice Factor

Folic acid, so named because it is most abundant in leaves, was discovered as an important factor in yeast nutrition. Its isolation was accomplished by Mitchell *et al.* (*J. Amer. Chem. Soc.*, 1941, **63**, 2284), who report its presence in all animal tissues examined. Further study of this factor will show how far it is connected with the " grass juice factor " (Hogan and Johnson, *Proc. Soc. exp. Biol. Med.*, 1936, **35**, 217; Kohler *et al.*, *Science*, 1936, **83**, 405) which has a growth-stimulating effect on guinea pigs.

Temperature Control in Grain Stores

(*Continued from page 260*)

trasting colours. This is specially constructed to meet the requirements of processes of long duration such as the storage of grain, and where the temperatures tend to change gradually, or where they differ but are always in the same approximate relationship. Once a minute, or at any more frequent intervals, the print wheel of this recorder turns to position and stamps a clearly defined dot on a wide strip chart, and beside it an identifying numeral.

Central Meter Sets

This arrangement affords scope for the most intimate forms of comparison, and leaves little to doubt or speculation. In some of the largest granaries central meter sets are equipped with rotary selector switches and edge-scale instruments which obviate the need for a switchboard, while each set is enclosed in a watertight casing of selected refractory or other similar material. The advantages of the automatic system are principally to be seen in the fact that neither negligence nor carelessness can cause an error, since all stages of the temperature of the grain are not merely to be seen, but are available for comparison or reference. Some of the smaller modern silos make use of an indicating recorder of the circular chart type, as distinct from the cylindrical shape, but which is supplemented by the use of a large black pointer. The idea of this is that the dial is visible from a distance, and the position of several pointers may be observed without the need for scrutinising the actual chart which has been drawn, and which may be inspected later. If so desired, either single or double measuring elements can be fitted in the temperature columns, according to whether recording, indication, or both together are required, but the latter system is by far the most popular to-day.

BOOKS RECEIVED

Starch and its Derivatives. By J. A. Radley, M.Sc., F.I.C. Second edition.

Wise Eating in Wartime. From the Ministry of Food's Kitchen Front Broadcasts.

Industrial Recruitment and Training. Report of a Joint Conference of the National Institute of Industrial Psychology and the Institute of Labour Management held on March 6, 1943.

Fruit Preservation by Sulphur Dioxide

Part II

SPECIALLY CONTRIBUTED

SULPHUR dioxide in one or other of its forms is now the only preservative used for fruits destined for jam manufacture, and the requirements for the trade have been fairly well investigated. The quality of jam made from preserved fruit pulp is in general inferior to that made from fresh fruit, the preservative having possibly adverse effect on any of the following : colour, texture, set and flavour. It may also result in the retention of an excessive amount of sulphur dioxide in the finished jam or marmalade—that is, more than 40 parts per million.

As regards colour, although sulphur dioxide bleaches the natural fruit colours, particularly reds, these are largely restored when the preservative is driven off by boiling. Of the common jam fruits stawberries are the least satisfactory in this respect and usually require some artificial aid if the pink usually associated with this fruit is to be obtained. Texture is spoilt if undue breakdown or toughening of the fruit occurs, defects which may to a large extent be overcome by correct technique. The set of jam made from preserved fruit is affected particularly if the fruit is not heated before putting down in barrels. This is probably because the sulphur dioxide does not completely stop the destructive action of enzymes on the fruit pectin.

Retention of sulphur dioxide in jam made from preserved pulp depends on the amount of preservative originally added, the loss which has occurred during storage, the fruit content of the jam, the type of fruit and the details of boiling. Blackcurrants are particularly troublesome in this respect, and it may be necessary to add extra water during boiling to bring about sufficient volatilisation of preservative. This practice has its effect on inversion of the sugar and tends to spoil the flavour.

Experiments have been published this year dealing with the removal of sulphur dioxide from peaches, strawberries and dewberries.[11] The fruit was preserved with the usual amounts of sulphur dioxide and, after storage, boiled in a covered aluminium pan over gas with and without the addition of an equal weight of sugar. Very long periods of boiling, of the order of 1½ hours, were required to bring the preservative down to about 70 parts per million, at which level the taste was not noticeable. Even this residue is well above the amount tolerated in U.K., but the high figure is in part due to the use of a very high fruit content in the jams. A curious observation was that the sulphur dioxide was more rapidly removed when the vessel was kept covered. The explanation put forward is that the condensation which occurs when an open vessel is used results in the return of a fraction of the preservative. Preparing the jam under conditions more closely resembling those obtaining in the factory resulted in more effective volatilisation of sulphur dioxide. Boiling for 30 to 45 minutes in a steam-jacketed copper pan was as good as about three times as long over gas. Other means of removing sulphur dioxide were tried, such as bubbling with air and stirring in open vats, and were found not to reduce the time of boiling. It may be concluded that the type of pan and the method of heating are the important factors in determining the rate of removal of sulphur dioxide.

Methods for Fruits

Strawberries.—The correct degree of ripeness of strawberries for pulping depends on the variety and the amount of rough treatment the barrels receive before use. Thorough washing of the fruit before it is placed in the barrels is essential. Spray washers may be used for this purpose, or, for smaller quantities, a washing tank. Strawberry jam should contain a proportion of whole fruit and excessive breakdown during storage must be prevented. For this purpose the hardening effect of calcium on the tissue of fruits, etc., is utilised. Calcium is added either as bisulphite or by dissolving a proportion of calcium carbonate in the sulphur dioxide solution to be used for preserving the berries. The quantity to be added will depend upon the degree of ripeness, varying from 450 for unripe berries to 900 for fully ripe berries, expressed as parts of calcium carbonate per million of fruit.[2]

Different salts of calcium differ in their hardening effect. In a recent article twelve treatments are described which gave berries of decreasing hardness as follows :[11]

(*a*) Berries stood in water with 0·05 per cent. calcium carbonate 30 minutes, drained, SO_2 added to make about 2,200 p.p.m.
(*b*) SO_2 added to berries with 0·05 per cent. calcium carbonate to make about 200 p.p.m.
(*c*) as (*b*) but with 0·126 per cent. of monocalcium phosphate.
(*d*) as (*a*) but with 0·126 per cent. of monocalcium phosphate.
(*e*) as (*a*) but with 0·028 per cent. of calcium oxide.
(*f*) as (*b*) but with 0·073 per cent. of calcium chloride.
(*g*) as (*b*) but with 0·028 per cent. of calcium oxide.
(*h*) as (*a*) but with 0·068 per cent. of calcium sulphate.
(*i*) as (*b*) but with 0·068 per cent. of calcium sulphate.
(*j*) as (*a*) but with 0·073 per cent. of calcium chloride.
(*k*) SO_2 added to berries to make about 2,200 p.p.m.
(*l*) Berries stood in water 30 minutes, drained, SO_2 added to make about 2,200 p.p.m.

This order of hardening effect appears to be peculiar to strawberries as quite a different order holds for dewberries subjected to a similar set of conditions.

The rate of penetration of strawberries by preservative solution is influenced by the presence of calcium salts, the penetration as a rule being less rapid as the hardening effect is greater. The differences, however, do not appear to have any technical importance at present as a large proportion of the preservative is absorbed in the first five hours in all cases.

If the volume of preservative solution used is insufficient to cover the berries, extra water must be added.

The Ministry of Food Order[12] on Fruit Pulps allows not more than 1 gallon of water plus 3 pints of preservative per cwt. of fruit in the case of strawberries.

Raspberries.—Raspberries are preserved cold but in their case there is no need to retain the fruit in a whole condition. In fact, it is an advantage to mash them thoroughly. The preservative solution, at a level of about 2,000 parts of SO_2 per million, preferably sulphur dioxide solution only, is added in four parts, one before any fruit is put in the barrel, one when half full, one when three-quarters full and one through bung after heading the barrel. Even distribution of sulphur dioxide is not easily attained with fruit of this kind and failure in this direction easily leads to trouble. No water is used except that containing the preservative.[12]

Blackcurrants.—Blackcurrants tend to have hard skins, a defect which is accentuated if the raw fruit is brought into contact with preservative solution. This is overcome by heating the fruit, together with about a fifth of its weight of water, at 190° F. to 200° F. until smooth. The fruit should be cooled to 160° F. before filling into oak barrels. Preservative in the form of sulphur dioxide solution is added, one-third before the pulp, one-third half full and one-third on top. The total added water must not exceed 1¼ gallons plus 3 pints of added preservative per cwt. of fruit. The quantity of water suggested above is in excess of this and allows for the evaporation of about 1 gallon of water.

Plums.—Plums are usually pulped by the hot process, a method which gives a product which has found acceptance owing to the good setting properties of the resulting jam. The process is similar to that employed for blackcurrants, sulphur dioxide solution being the preferred form of preservative in an amount equal to about 1,000 parts per million. Added water must not exceed 1¼ gallons for hot-processed pulp, or 6 gallons for cold-processed pulp, per cwt. of fruit. Three pints of preservative are allowed in addition to the water in both cases.

The University of Bristol Agricultural and Horticultural Research Station have investigated a cold process for preserving plums and claim certain advantages for it, particularly for the rapid handling of a glut of plums.[3] It may be possible by this means to preserve the fruit in the orchard, as very little plant is involved. The cold process consists simply of covering the plums with sulphur dioxide solution to give a preservative concentration of 1,000 to 1,500 parts per million and sealing down to prevent the access of air. Jams were prepared from hot-processed and cold-processed plums, using the following quantities of ingredients: hot-processed, 4 lbs. of pulp to 3½ lbs. of sugar; cold-processed, 3 lbs. 13½ ozs. of whole fruit and corresponding proportion of liquor to 3½ lbs. of sugar. All these jams set in a satisfactory manner, the hot-processed fruit giving a firmer set. Unfortunately they were made to contain between 60 and 70 per cent. of fruit and so bear little relation to commercial jams which, before the war, contained between 40 and 50 per cent. of fruit and are now limited by a Ministry of Food Order to 40 per cent.[13] Using these smaller quantities of fruit it is probable that the jams prepared with cold-processed plums would not have set. This, however, need not prove an insurmountable obstacle to their use. A set can always be obtained by the addition of pectin. Other figures of interest resulting from the investigation are given in Table 3.

TABLE 3.

COMPARISON OF JAMS FROM HOT- AND COLD-PROCESSED PLUMS.

	Calcium Pectate. Total.	*Soluble.*	*Jelly Strength. (B.A.R. Tester.)*
Victoria, cold-processed	0·651	0·158	3
Victoria, hot-processed ...	0·810	0·826	22
Purple Pershore, cold-processed	0·525	0·092	9
Purple Pershore, hot-processed	0·662	—	43

A definite advantage of cold-processed plums is the lower residual sulphur dioxide in the jams. All the jams prepared from the hot-processed fruit had more than the legal maximum, but this is partly due to the use of such high proportions of fruit. It was found that after storage the stones of cold-processed plums contained a much larger amount of sulphur dioxide than the skins, pulp or liquor.

Cherries.—It is appropriate here to discuss the preservation of cherries, as their treatment is in many ways similar to that of jam fruits. The object of preservation in this case is to prepare firm cherries of light straw colour, free from blemishes, which will take artificial colouring well and absorb sugar freely. The chief outlet is to the *glacé* and maraschino trades. The fruit is sulphured cold with sufficient calcium to give the required degree of hardness. The process described below is that used by producers in British Columbia.[2] The degree of ripeness is important and may be judged by appearance or with a refractometer.

The cherries are freed from defective fruit and barrelled within about 12 hours of picking, 240 lbs. in a 40-gallon paraffin-lined barrel. The preservative solution, a 1 per cent. solution of sulphur dioxide containing 6 lbs. of calcium carbonate per 1,000 gallons, is added and the barrel closed and given a quarter turn every day for 10 days. On the fifth and tenth days the bung is removed and the barrel filled with preservative solution. In this condition the fruit may be held for up to 2 years. After 2 weeks the cherries may be removed for pitting and grading and may be returned to the barrel, which is filled up with the same preservative solution.

Satisfactory preservation of fruit in barrels is seen to depend on careful observance of the following points: (1) the fruit should be carefully prepared before adding the preservative. This includes cleaning where necessary and cooking in the case of blackcurrants, plums, etc.; (2) the preservative solution should be suitable for the particular fruit, calcium salts being added when hardening is desired and avoided when this would be objectionable; (3) the preservative must be evenly distributed in the barrel. This is effected by adding it in parts as the barrel is filled with fruit and rolling the barrel occasionally; (4) fruit should be kept completely covered and evaporation made up by adding more preservative solution; (5) access of air is undesirable; (6) pulp for sale should not contain more than the legal quantities of sulphur dioxide; (7) use of clean barrels.

Dried Fruit

An essential step in the production of dried fruits, sultanas, peaches, apricots, pears, etc., is the sulphuring

process to which they are subjected before drying. The fruits are stacked on trays and placed in sulphur houses where they are exposed for a set period of time to the fumes of burning sulphur. Without sulphuring, these fruits cannot be dried to an acceptable product, the colour being dark and unattractive and the flesh hard. In the United States, particularly California, the changes occurring during sulphuring have been studied with a view to establishing the best conditions for carrying out this process.[4] During the drying operation which follows sulphuring a considerable proportion of the sulphur dioxide is lost. In general, good quality in the finished product is associated with a high retention of sulphur dioxide. This in turn is favoured by a high temperature of sulphuring. Pre-treatment of the fruit just before sulphuring may also assist retention. For instance, dipping apricots in 2 per cent. to 5 per cent. sodium citrate increases the residual sulphur dioxide in fruit which contained 4,000 p.p.m. before drying, from 400 p.p.m. to 1,000 p.p.m. This increased retention is reflected in a better quality product.[4,5] The action of the sulphur dioxide is apparently partly due to its inhibiting action on oxidases present in the fruit.[6]

During storage of dried fruits there is a steady loss of sulphur dioxide mainly due to oxidation to sulphuric acid.[7] This does not affect the quality until the content falls to a figure in the neighbourhood of 500 p.p.m., when accelerated darkening occurs. Loss of sulphur dioxide is favoured by high temperature and high moisture content of the fruit.[4]

The nutritive value of dried fruit is affected by its sulphur dioxide content. The preservative has a stabilising effect on vitamins A and C, destroys vitamin B_1 and is neutral to riboflavin.[6] As dried fruits may provide quite useful amounts of the A and C vitamins and can only be of very minor importance as sources of B_1, the presence of sulphur dioxide in these foods is a decided advantage to their nutritive value. The loss of sulphur dioxide during storage is reflected in an increased rate of destruction of vitamin C, particularly when the former falls below about 400 p.p.m. In view of this it has been suggested that in addition to the usual maximum permitted preservative a minimum of about 500 p.p.m. should also be stipulated for dried fruits.

Fruit Juice and Wine

Unless fruit juices are bottled in a sterile manner and are to be used very soon after breaking the seal, some preservative is necessary. Benzoic acid and sulphur dioxide are the only permissible substances and both of these have points in their favour.[8] Sulphur dioxide in sufficient quantity to prevent growth of micro-organisms (1,000 p.p.m. in acid juices) has an objectionable taste, whereas benzoic acid of sufficient purity is effective in concentrations which cannot be detected by taste. Sulphur dioxide, however, has the additional effect of preventing oxidation and consequent loss of flavour, colour and nutritive value, and it has been found that this action is brought about by much lower concentrations than are required for the inhibition of organisms. These facts suggest the use of a combination of two preservatives: between 200 and 350 p.p.m. of sulphur dioxide to take care of oxidative changes and about 500 p.p.m. of benzoic acid to control the growth of micro-organisms. Fruit juice preserved with such a mixture of chemicals would not meet the requirements of our present food laws.

Light wines of low alcohol content are in some cases in need of a preservative and the behaviour of sulphur dioxide for this purpose has received some study.[9] There is a continuous loss of preservative during storage from all types of wine. In dry wines most of the sulphur dioxide after six months remains "free", whereas in light sweet wines the larger part is "fixed"—that is, combined with the sugar. This is of some importance because the preservative action is mostly contributed by the free sulphur dioxide.[10] The loss of sulphur dioxide during storage is more rapid from dry than from sweet wines.

REFERENCES

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2. Atkinson and Strachan, *Fruit Products Journal*, 1941-42, vol. 21.
3. Charley and others, *University of Bristol Agricultural and Horticultural Research Station*, Annual Reports, 1934 and 1941.
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5. Mrak and others, *ibid.*, 1941, **21**, 13 & 297.
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10. Bioletti and Cruess, *California Experimental Station Bulletin*, 230 (1940).
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12. S.R. & O. 1941, No. 814.
13. S.R. & O. 1942, No. 2482.

Food Substitutes and Adulteration

(*Continued from page* 258)

banana" which was condemned on account of excessive claims, but when the manufacturers offered to fight an expensive legal action the matter was taken up with the Ministry of Food, who ordered it to be removed from the market. In both cases the action of the Ministry of Food must have prevented many future court cases.

Two samples of gelatine contained excessive amounts of arsenic, these being $\frac{1}{3}$ grain and 1/40 grain per lb., whereas the recognised maximum quantity permitted is 1/100 grain per lb. The opinion is expressed that in view of the quantities in which gelatine is normally consumed it was doubtful whether any real risk was being run, but it is better to be on the safe side. The foregoing, of course, are only examples of the large number of samples examined and are cited as having special interest.

TO AUTHORS

FOOD MANUFACTURE is prepared to consider the publication of any books on scientific and technical subjects which authors might care to submit.

Ministry of Food

Latest Statutory Rules and Orders

The list given below is the continuation of the list of Orders published in *Food Manufacture*, June 1, page 190.

No.	Date. 1943.		
		PRICE FIXATION ORDERS	
292	Feb. 25.	Meat Feeding Stuffs (Control and Maximum Prices) Order, 1943. (See February list.) Revokes S.R. & O. 1941 No. 1492; 1942 No. 873.
327	Mar. 4.	Amending the Meat (Maximum Retail Prices) Order, 1942.
361	,, 9.	Amending the Cereal Breakfast Foods (Control and Maximum Prices) Order, 1941.
369	,, 10.	Amending the Jam and Marmalade (Maximum Prices) Order, 1942.
391	,, 10.	Directions, supplementary to the Carrots (1942 Crop) (Control and Prices) Order, 1942.
407	,, 10.	Amending the Hay (Maximum Prices) (Northern Ireland) Order, 1942.
447	,, 20.	Revoking the Meat (Prescribed Wholesale Prices) Order, 1940. Revokes S.R. & O. 1940 Nos. 42 and 327; 1941 No. 10.
459	,, 24.	Home-Produced Canned Fish (Maximum Prices) Order, 1943.
480	,, 26.	Amending the Home-Grown Wheat (Control and Prices) (Great Britain) Order, 1942.
496	,, 30.	Amending the Bread (Control and Maximum Prices) Order, 1943.
497	,, 30.	Fish (Maximum Prices) Order, 1943. Revokes S.R. & O. 1942 No. 1910; 1943 No. 212.
508	,, 31.	Amending the Eggs (Control and Prices) (Northern Ireland) (No. 3) Order, 1941.
509	,, 31.	Milk (Maximum Prices) (England and Wales) Order, 1943. Revokes S.R. & O. 1942 Nos. 2016 and 2179.
		CONFECTIONERY
445	Mar. 20.	Amending the Sugar Confectionery (Maximum Prices) Order, 1941.
		FEEDING STUFFS
441	Mar. 19.	General Licence, under the Feeding Stuffs (Regulation of Manufacture) Order, 1942. Revokes S.R. & O. 1942 No. 2056.
460	,, 23.	General Licence, under the Feeding Stuffs (Regulation of Manufacture) Order, 1942.
514	Apr. 2.	Amending the Feeding Stuffs (Rationing) Order, 1942.
516	,, 3.	(National Priority Pigeon Mixture). Revokes S.R. & O. 1941 No. 82; 1942 No. 1902
625	,, 22.	Flour Feeding Stuffs. See Flour.

No.	Date. 1943.		
		GENERAL	
290	Feb. 25.	Licensing of Establishments. (See February list.) Revokes S.R. & O. 1941 No. 1887; 1942 Nos. 437, 885, 1471 and 1730.
291	,, 25.	Local Distribution. (See February list.) Revokes S.R. & O. 1939 No. 1312; 1941 No. 1888; 1942 Nos. 437, 885 and 1731.
345	Mar. 6.	General Licence, under the Food (Local Distribution) Order, 1943.
362/S10	,, 9.	Amending the Retail Deliveries (St. Andrews) Order, 1942.
498	,, 30.	Order, Revoking the Canned Corned Meat (Prohibition of Sales) Order, 1942. Revokes S.R. & O. 1942 No. 762.
566	Apr. 12.	General Licence under the Food (Local Distribution) Order, 1943, and the Potatoes (1942 Crop) (Control and Prices) (No. 2) Order, 1942.
628	,, 23.	Amending the Meals in Establishments Order, 1942.
632	,, 24.	Fresh Fruit, Vegetables and Flowers (Use of Containers) Order. Revokes S.R. & O. 1942 No. 1074.
		MILK
405	Mar. 12.	Directions, supplementary to the Milk (Control of Supplies) Order, 1942, and the Milk (Control of Supplies) (Scotland) Order, 1942. Revokes S.R. & O. 1943 No. 233. Art. 2 only.
432	,, 18.	Amending the Milk (Scheme of Supply) Order, 1942.
		RATIONING
507	Mar. 31.	Amending the Food Rationing Orders, 1942.
		POINTS RATIONING
343	Mar. 6.	(Points Rationing) Order. Revokes S.R. & O. 1942 Nos. 1480, 1681, 1913, 2050, 2135, 2347 and 2526; 1943 Nos. 47 and 175.
344	,, 6.	General Licence, under the Food (Points Rationing) Order, 1943.
368	,, 10.	General Licence (Personal Points).
446	,, 20.	General Licence (Personal Points) (Sugar Confectionery).
		TRANSPORT
370	Mar. 11.	Direction (No. 2) (Carrots). Revokes S.R. & O. 1943 No. 24.
392	,, 10.	Directions (Carrots).

How many Mouths per Hectare?

THE SERIES entitled "The World To-day", to which this book* belongs, has hitherto treated of separate nations or national groups. In order to appreciate the problem discussed it is necessary to discard entirely the familiar notions of Europe as a congeries of nations or as a set of warring industrial economies; likewise must be put away ideas about tangled nationalities and hopeless frontier questions. The problem of food and farming in post-war Europe is not one of politics or boundaries, though these may unnecessarily make the solution more difficult to come by; nor is the problem one of geography in the political sense, though it is bound up with geography in the real climatic and demographic senses.

The book does not especially discuss relief plans for the feeding of Europe immediately after the war. That is a matter of transport and organisation, given the necessary import surpluses. The problem of food production on land in Europe goes much deeper than is usually realised. Yet it is simple to state it; and perhaps its essence is too simple to be readily grasped in our complicated and mainly urban civilisation.

There are 170,000,000 peasants in Europe. This half of the population of Europe lives on small farms; the produce of which forms the main and often the sole means of subsistence. They produce something more than their actual requirements of some staple food—for if they did not, how could the towns be fed?—but their surpluses are in quantity rather than variety: peasant diet is poor and restricted, and other wants are equally frugally met. A misery uncommon in Britain is the fragmentation of holdings into small strips scattered over a considerable area. The book devotes special attention to the problems arising out of this *parcellement*. More serious is the disjunction between the numbers of hectares and of the people which they are supposed to feed.

The reader is left in no doubt about the profound gravity of this problem, which is really one of pressure of population. The authors present the problem lucidly, and discuss possible solutions. It is probably best to let the reader judge whether the authors' suggestions are likely to meet the case. The problem recalls those puzzles in which a number of square pieces of wood are enclosed in a rectangular box, and, one or two squares being left vacant, the solver has to slide a piece from one corner to another without jumping over an occupied square; however, in attempting to solve the peasant's subsistence problem of Europe, it appears doubtful whether *any* square has been left vacant for the first move, and it seems as if nothing short of a severe depopulation could give the reformer a chance. Except in Hungary and in Spain the breaking-up of large estates is not likely to afford much relief.

Suggesting that existing practices need not be perpetuated, the authors say: "These things can be changed—for the better. The task may be gigantic; but the men are there, the knowledge is there. They only need to be applied to the job." This, of course, does not hold only for continental Europe; it is true of Britain too. So it may be suggested that without waiting for the end of the war we first make an earnest attempt to apply our knowledge to Scotland, where there are more hectares than families.

It is not too much to say that some widely-advocated reforms will be seen in a fresh light by most readers of this book. Unless he belongs to the few with special knowledge of the conditions, one who has not read this book can hardly afford to pronounce about European agriculture; and it is fairly safe to say that a person who has read it will learn something of the realities underlying the European situation.

The book is of handy form, is illustrated with well-chosen "nutshell" maps and photographs, and has the unexpected merit of being as readable as a good novel.

HUGH NICOL.

* *Food and Farming in Post-war Europe.* By P. Lamartine Yates and D. Warriner. Pp. 118. London. 1943. 3s. 6d. net.

Starch and its Derivatives

The need to commence a second edition of a book only some eight months after the appearance of the first edition is a token of its success. The second edition of Mr. Radley's book* is a good example not only of success but of real hard work, including as it does eleven new or completely rewritten chapters and some 1,200 additional references, besides many photographs and diagrams.

Describing the scheme of his work, the author states that he has discarded a good deal of matter relating to older work included in the old edition owing to the fact that later observations have given the subject fresh significance and explanation. However, he has wisely retained the references to this work in order that those interested may follow the subject through every phase of its development.

An entirely new chapter on the rôle of starch in the plant has been added, and there are discussed observations by numerous workers on the effects of the different factors such as light, water content, presence of inorganic salts, temperature, sugar concentration, etc., on the starch-sugar balance. One important point which emerges from some of this work is that sucrose, fructose and glucose are the main substances produced when starch is broken down in the plant.

Starch in the Food Industry

One of the new chapters is headed "The Foodstuff Industry", which will have special interest for the readers of FOOD MANUFACTURE. Potato products in the food industry are discussed and their manufacture and use is described. In the U.S.A. and Canada potato starch is blended with maize, tapioca and wheat to produce varieties of custard, blancmange and pie-filler powders. In cake mixtures, especially those of

* *Starch and its Derivatives.* By J. A. Radley, M.Sc., F.I.C. Second Edition. Pp. xii+558. 1943. 36s. net.

the waffle and sponge-cake type, a far superior product is said to be obtained by using up to 40 per cent. of potato flour to replace the wheat flour. Potato starch is also used in soup and gravy powders.

The importance of the storage history of potatoes is stressed and reference in some detail is made to the work of J. Wright and Barker, showing that the variation of the sugar content of potatoes, amounting to 0·2-6·8 per cent., is dependent on the storage temperature. When potatoes are stored the following reactions take place :

$$\text{Starch} \rightleftharpoons \text{sugar} \rightleftharpoons CO_2 \text{ and water.}$$

Lowering of the temperature to below 4·5° C. leads to the formation of more sugar, and at 0° C. 3 per cent. of sugar is the equilibrium concentration.

Some interesting data on the cooking of potatoes is given both with reference to the vitamin C content and the physico-chemical changes taking place in cooking.

A couple of pages are devoted to the gelatinisation of starch, and reference is made to the work of Professor Sybil Woodruff, who examined and photographed gels made at different temperatures from starches used in the food industry.

Blancmange and Custard Powders

Those interested in blancmange and custard powder manufacture will appreciate mention of the work of Chapman and Buchanan, who studied the syneresis or slow separation of water from gels of maize, wheat, rice and potato starches and who consider that neither the rate nor the time of heating the suspension affects the rigidity or the amount of syneresis in the resulting gels. The nature of the gels from the different cereals is briefly described. A question that has cropped up recently is the effect of various factors on the gel strength of starch pastes. In making custard or blancmange powders a point of interest is that different strengths may be obtained from the use of different batches of the same starch, and the author mentions Woodruff's observations that the ability of a starch to form a gel can vary according to the source of the starch. For instance, it was found that gels of maize starch made from corn which had suffered from heavy frosts before it is completely mature do not leave the mould as cleanly as usual, but that the ability to form a gel did not appear to be noticeably affected. Further details under this sub-heading are concerned with purification processes during the manufacture of starch and the effect of freezing on starch pastes.

Under the caption " Uses of Starch in Various Foodstuff Preparations ", Mr. Radley gives a brief account of its use in the manufacture of custard powders, ice cream powders, cake powders, blancmange powders, etc., and mentions the manufacture of vinegar from maize starch and also its use as a comparatively inert filler in baking powder. Some reference is also made to its use in the confectionery trade.

Starch in the Baking Industry

Considerable attention is given to the use of starch in the baking industry. In fact, eight and a half out of the total of twenty-two pages in the chapter " The Foodstuff Industry " are occupied in this discussion.

For those workers in botany and biology and those connected with the baking, food, brewing and fermentation industries, the new section on amylases and their action on starch will appeal. This constitutes an important new feature of the work, and hundreds of references to the literature are given.

Apart from these important additions to the book, the remaining sections have been largely re-written and added to. In his Preface the author points out how difficult a matter it is for one worker to deal with a number of different industries in one volume and avoid over-emphasis or under-statement of the importance of the various points. It is natural that specialists in any given branch of the subject tend to feel that more could have been written on it, but, taken as a whole, the book is admirably balanced. Mr. Radley has apparently left no stone unturned in his search for references, which search has been rendered more difficult owing to the uncertain or non-arrival of papers from European sources. He has aimed, however, to include mention of all the more important work published to the end of 1941.

Bacteriology in the Cannery

Mr. J. G. Baumgartner is senior bacteriologist in a large modern canning factory and has written a handy-sized book* on microbiology of canned foods, and has done it very well. He states that his book had its origin in a series of notes concerning certain microbiological aspects of food canning written for distribution among his colleagues on the technical staff of his firm, and it is for chemists and technologists engaged in the canning industry, already familiar with elementary bacteriological research, that it is primarily intended. The publication of a book of this nature is a token of the emergence of canning from an art into a science. A quarter of a century ago such a thing as a bacteriological laboratory in a canning factory was almost unknown. In South America during the last war the sudden appearance of a putrefactive anaerobe of high thermal death point in meat factories situated at widely dispersed points caused such dismay that bacteriological laboratories were hurriedly installed.

While the author gives a good general description of bacteria, yeasts and moulds, he does not clutter up his space with those details of technique which can be found in textbooks. All the 157 pages are full of just the information that is needed in a canning laboratory.

The principal spoilage organisms and methods for their control are described. With due economy, but extreme clarity, the author gives an outline of canning operations and also the chief mechanical causes of spoilage. The technique of sampling and laboratory examination is also clearly explained.

There is not an unnecessary sentence in this short book, but the canning bacteriologist will be able to find practically everything there which would enable him to approach any bacteriological problem that might crop up in the factory. The list of references will enable him to put his hand on any aspect of the subject which he might need to study in greater detail

* *Canned Foods: An Introduction to their Microbiology.* By J. G. Baumgartner. Pp. viii + 157. 1943. 10s. 6d.

Economisers in the Boiler House

H. C. APPLEBY, A.M.I.Mech.E., M.Inst.F.

ALTHOUGH an economiser is essentially a feed-water heater, the latter term is reserved for an appliance in which the feed-water is heated by exhaust or, sometimes, live steam.

The type of economiser with which all steam-raising engineers are familiar is the one used in connexion with Lancashire boilers. It consists essentially of vertical cast-iron tubes made up into sections of four, six, eight or ten tubes, erected in parallel. The sections are connected at the top by plain branch pipes, and at the bottom by access branch pipes, running lengthwise on opposite sides. The sections are contained in a brickwork chamber with the branch pipes outside. To keep the exterior of the tubes free from soot, the great enemy of heat transmission, scrapers, operated continuously by overhead gear on top of the brickwork chamber, move slowly up and down and the dislodged soot falls into a pit formed by the brickwork foundations, from which it can easily be removed. The scrapers are on four sections of the tubes, operated by one pulley, and hence the total number of sections in this type of economiser is some multiple of four. Blow-off and safety valves are fitted.

Erection of Economiser

The economiser is erected in the main flue, between the boiler and the chimney, and a by-pass flue provided for the flue gases, so that the boiler-plant need not be stopped when the economiser is out of commission for inspection or cleaning purposes. The by-pass flue is also used whenever the flow of feed water through the economiser is stopped. Failure to do this may result in the formation of steam in the economiser, and this is dangerous, as this type of economiser is not designed for producing steam.

The feed-water is pumped through the economiser on its way to the boiler, whilst the hot gases from the boiler pass through the economiser chamber, striking the vertical pipes at right angles, and giving up heat to them, which they in turn transmit to the water by conduction.

The water enters at the bottom and rises simultaneously and slowly up all the tubes, and flows from the sections into the plain branch pipes at the top. The size of economisers required for a Lancashire boiler plant is determined principally by the amount of water evaporated per hour. To attain the highest efficiency, it is advisable that the water capacity of the economiser should be equal to one hour's evaporation of the boiler plant.

Economy of Coal

The tubes of economisers used in connexion with the Lancashire boilers are mostly 9 feet long and hold about 1 cubic foot, or 62½ lbs., of water. If the evaporation per hour is 6,000 lbs. per boiler, then, by dividing by 62½, the number of tubes required per boiler is ascertained, and this equals 96. Another but more approximate method of arriving at the number of tubes required is to allow five tubes for each ton of coal burnt per week of 50 hours. Thus a boiler burning 25 tons of coal per week would require (25 × 5 = 125) 9-feet tubes, or say 128 tubes, this being the nearest standard size. Without an economiser, a Lancashire boiler is a very wasteful steam producer, but there are still, unfortunately, a large number of works without such an appliance. In time past, lack of space may have prevented the addition of an economiser as just described, and if this is so the position should be immediately reviewed in the light of the modern compact designs now available, which can be fitted into any corner.

Tests have shown that flue gases leave Lancashire boilers at temperatures anywhere between 650° F. and 1050° F. (343° and 566° C.), the average being in the neighbourhood of 750° F. (398° C.). Even when combustion conditions are good, and the minimum weight of excess air is used (indicated by a high CO_2 reading), the waste is enormous.

When large quantities of excess air are allowed to enter the furnaces and flues the potential waste is further increased, and the more valuable does the economiser become. If the weight of the dry flue-gases per pound of dry fuel burnt is 20 lbs. and the temperature as they leave the last heating surface of the boiler is 750° F., the air being 70° F., the heat content is $20 \times 0{\cdot}24\ (750-70) = 3{,}264$ B.Th.U. If the B.Th.U. content of the coal is 12,500, the loss represented by 3,264 B.Th.U. is 26 per cent.

Other Functions

The claims made for the economiser, just described, are that it results in a considerable reduction in the consumption of fuel, or, on the other hand, an increase in the steaming capacity of the boiler without any corresponding increase in fuel consumption on the grate. In addition, it provides a large reserve of hot water to meet sudden steam demands during peak loads, or in times of emergency, and enables a more uniform rate of steaming to be maintained. An economiser of this type purifies the water to some extent before it enters the boiler. Some of the scale which would otherwise enter the boiler is deposited in the tubes and can be more easily removed from that position; also, owing to slower circulation, impurities held in suspension are deposited in the bottom headers. It is inadvisable to pump cold water into an economiser, as this may lead to external corrosion, particularly of the cooler portions, by the deposition of moisture, usually of an acid character, from the flue gases. To avoid this trouble the water should have a minimum temperature of about 110° F. (43° C.) or more. If it is impossible to arrange for this, an appliance known as a circulator may be fitted, which mixes a portion of the heated water from the economiser with the incoming feed and so raises its temperature to the desired level.

Water-Tube Boilers

With the introduction of water-tube boilers and the demand for higher steam pressures, the economiser had to be modified to meet the new condition. Whereas it had previously been sufficient to force the tubes and headers of the sections together by hydraulic pressure, it was now found necessary to increase the strength, by "staying" a number of the socket joints. The

headers were also strengthened by being made circular, and the lids, whilst retaining the usual internal conical design, were made smaller than the standard internal lid.

All the essential features of the original vertical economiser, including the scraping gear, were maintained in these designs, and it was found possible to build them on top of water-tube boilers and include them in the boiler casing, thus making an integral boiler unit. The headroom necessary for such an arrangement was not always available, and this led to the introduction of the horizontal economiser with vertical or horizontal baffles. As scrapers could no longer be fitted, the problem of keeping the tubes free from sooty and gritty deposit was tackled by means of steam or air blowers.

Further Developments

The next stages of the development of the economiser were influenced by two factors: (1) the recognition of the fact, known for many years, that rates of heat transfer could be greatly increased by sufficient increase in gas velocity and (2) the birth of the idea that if the amount of the external surface of the economiser could be increased in relation to the amount of internal surface the resistance of the former to heat transmission would be proportionately lessened.

The recognition of the importance of the above factors led to the invention of "gilled-tube" economisers, of which there are now a number of different designs (which vary in shape and size according to the ideas of the different makers), so that it is several times greater than the internal surface and the velocities of the flue gas and water are very much higher than those previously employed.

In these days economisers are not looked upon simply as heat recovery appliances, but are an integral part of the design of modern boiler plant.

Increasing Economiser Surface

A study of heat transmission in a water-tube boiler showed that the last passes are relatively inefficient compared with the first row of tubes, this being partly due to the low difference in temperature between the gases and the water in the boiler, and partly to the impossibility of arranging the relative flow of gases and the water to secure the best results with low temperature difference. Increases in the working pressures of boilers meant higher steam temperatures, and consequently increases in the temperature of the boiler exit flue gases, and, rather than add extra tubes to the boiler to absorb the heat that might otherwise be wasted, it is considered more economical to design the economiser to do this extra work. In other words, it is considered better to increase the amount of economiser surface rather than boiler surface, as, in addition to increasing the efficiency of heat transmission, the capital outlay for a given capacity may be considerably reduced

With the older types of economisers, care had to be taken to prevent the formation of steam in them, and it was assumed that the limit of increase in economiser heating surface, and the reduction of boiler surface, would be reached when the economiser had become of such a size that the temperature of the water leaving it would be the temperature of the saturated steam in the boiler. It was never contemplated that steam might be raised in an economiser, but modern design and materials have made this possible. In the steaming economiser a certain proportion of the total steam output is deliberately generated. The steam economiser can be arranged to give almost perfect contra-flow conditions, thus securing the highest temperature head available. At the same time, from the nature of its construction, the tubes can be spaced more closely together, giving the advantage of high velocities of gas flow, and consequently rates of heat transfer much greater than those in the portions of the boiler replaced.

Heat Surface in Steaming Economy

In general, therefore, the amount of heat surface in the steaming economy required for a given duty is less than that of the surface of the combined boiler and standard economiser hitherto required for the same duty. As the cost of economiser surface is less than the corresponding amount of alternative surface it replaces, an additional saving is effected in building and structural costs. The designer of an economiser intended to work in conjunction with a modern boiler plant has not only to concern himself with the provision of installing sufficient heating surface, to absorb the required amount of heat from the flue gases and transmit it to the feed water, but he must pay attention to various factors which present difficulties in attaining the desired object. For example, the gases are usually dust-laden, and the deposition of dust on the heating surfaces obstructs the transmission of heat; the temperature of the feed-water absorbing the heat can vary very rapidly; the rate of flow of the feed-water is often very variable, and at times may cease altogether; and, finally, steam may be generated in the economiser.

It will be appreciated, therefore, that an economiser must be designed so that the heating surface will collect the minimum amount of dust and so maintain its efficiency; the tubes must be able to expand and contract with freedom, when changes in water temperature occur, without putting strain on the joints; and any steam which is generated in the economiser must be enabled to escape freely, with the water, to the boiler drum without causing water-hammer.

Other requirements are that the parts should be accessible, and easily cleaned, both externally and internally; and the cost of construction, installation and maintenance, in relation to the duty performed, should be such as to give the greatest possible return on the capital expended.

When modern economisers are installed, mechanical draught is a necessity, and it is the endeavour of the designer so to shape and place the elements that friction between the gases and the heating surfaces is reduced to a minimum, and the velocity of flow of the gases remains constant and is not checked by sudden changes in the direction of flow.

British Material for Export

Overseas readers are advised that the fact that goods made of raw materials in short supply owing to war conditions are advertised in FOOD MANUFACTURE should not be taken as an indication that they are necessarily available for export.

News from the Industry

Fruit and Vegetable Products

The Minister of Food announces that he has appointed Mr. S. Oswald Chivers as Honorary Technical Adviser to the Ministry of Food on Fruit and Vegetable Products.

* * *

Milk Division

Mr. W. M. Hood, Director of Milk (England and Wales), has resigned his appointment owing to ill-health. The Minister has regretfully accepted his resignation, and desires to take this opportunity of expressing his appreciation of Mr. Hood's services to the Ministry, first as Director of Milk Movements and subsequently in his present post.

Mr. Hood has agreed to act as Adviser on Milk (England and Wales), and it is not proposed to appoint a Director in his place.

Mr. H. S. Hartley Smith has been appointed Deputy Director of Milk and Mr. N. B. Ashworth Deputy Director of Milk Movements.

* * *

Pre-packing of Bread Crumbs

The Minister of Food has made an Order under the Manufactured and Pre-packed Foods (Control) Order, which prohibits after August 1 the pre-packing of crumbs of bread, biscuits and other baked cereal products except under licence. A licence is also required from the same date for the manufacture and pre-packing of certain mixtures of such crumbs with herbs or spices—*e.g.*, stuffing mixtures. After October 31, products coming within the scope of the Order may only be sold if they have been licensed by the Ministry. There will thus be nine weeks in which stocks of products in respect of which a licence has not been issued may be disposed of.

Returns made by October 31, 1942, on form F.P.P. 1, as required under the Manufactured and Pre-packed Foods (Control) Order, in respect of any product affected by the new Order will automatically be treated as applications for licence, and those who have made such returns need make no further applications.

Bread Subsidy Claims

Many bakers are still claiming subsidy on bread which is sold free of price restrictions, such as proprietary bread, Vienna bread, rolls, etc. Claimants are therefore requested to exercise greater care in the preparation of their claims.

Claimants are also reminded that claims must be lodged not later than the date stated on the claim form.

* * *

Bakers' Flour Stocks

The Ministry of Food has from time to time recommended bakers to carry sufficient flour for fourteen days' normal bread production. There is evidence that this stock level is not being maintained.

At this stage of the war, when sudden calls on transport may be made for Service requirements, bakers are again reminded that they can best serve the national interests and secure the continuity of bread production by carrying adequate stocks of flour. The Ministry regards a two-weeks' flour supply as a safety minimum stock, and asks for the wholehearted co-operation of the trade in maintaining this level at all times.

* * *

Food from Royal Parks

More than 400 tons of food were grown in six Royal parks—Hampton Court, Bushey, Richmond, Greenwich, Green and Hyde—last year.

It included 88 tons of potatoes, 60 of straw, 66 of hay, and 48 of wheat.

In addition, the parks raised 6,600 lettuces, more than 3,000 cabbages, 600 endives and 396 corn cobs.

These totals are apart from the food grown by allotment-holders.

Royal deer from the parks provided seven tons of venison.

All the food goes through the ordinary trade markets, and the money goes to the National Exchequer.

Additional acreage has been allocated for food production this year.

Dominion Wines

The Ministry of Food recently authorised the shipment of a further 500 tons of wines of the port and sherry types and 100 tons of beverage wines from South Africa and Australia respectively, 10 per cent. of which has been earmarked for the use of H.M. Forces.

Some of this wine has now arrived and is in process of being cleared by the consignees. It will be distributed to the public under arrangements similar to those adopted in connection with the wines imported last year.

* * *

Cereal Research at St. Albans

The Ministry of Food has, by arrangement with the Department of Scientific and Industrial Research and the Flour Milling Industry, taken over for the period of the war the extensive laboratories at St. Albans which were previously occupied by the Research Association of British Flour Millers.

The Ministry will have the advantage of the use of these laboratories and the existing staff for the consideration of all food research problems, but they will continue to be used in the main for specialised work connected with cereals and cereal products. The laboratories will, in future, be known as the Cereals Research Station of the Ministry of Food.

Dr. P. Moran, D.Sc., Ph.D., who was previously Director of Research to the Research Association of British Flour Millers, has been acting as Deputy Scientific Adviser to the Ministry since June, 1940. In March last he was appointed, in addition, Director of Research in the Ministry of Food. In this latter capacity he will direct the work at St. Albans. From June 1, the date on which the transfer took place, the entire control and direction of the laboratories passed to the Ministry of Food.

The Ministry of Food much appreciates the public-spirited action of the milling industry in making these laboratories available to the Ministry for the remainder of the war period.

CHANGES OF ADDRESS

Thos. Broadbent and Sons Ltd.

The telephone number of Messrs. Thos. Broadbent and Sons, Ltd., Central Ironworks, Huddersfield, has been changed to Huddersfield 3520 (6 lines).

* * *

Board of Trade

The address of the Prosecutions Branch of the Board of Trade is now: Abbey House, Victoria Street, London, S.W. 1. Telephone No.: Abbey 4383.

* * *

Stephen G. Stevens, Ltd.

Stephen G. Stevens, Ltd., of 1, Brooker Street, Hove, 3 (telephone Hove 4546), advise that as from June 21, 1943, they have taken over larger offices and warehouse at 2, Shirley Street, Hove, 3. The telephone number remains the same.

Fish Canning Industry in New Zealand

A new fish canning industry has been started at Auckland. Big game fish caught in the Bay of Plenty will be canned. Sportsmen will do the catching. Fish merchants who are behind the plan hope after the war to develop a market in America for carcasses of swordfish and mako sharks.—*Reuter.*

* * *

Fish Research

During a recent visit to the Torry Fish Research Station, which is on active war work, along with the Ayrshire and Oxford centres, covering the processing of food with particular reference to wartime requirements, Lord Woolton saw lemon sole caught two years ago being thawed and cooked. On tasting it he found the fish delicious.

Other wartime developments seen and tasted were fish cakes made from dehydrated cod, kippers and haddock. Work at the Torry Station has made great progress in the preservation and preparation for distribution of fish products for the post-war market.

Beef Cattle Bones

"Approximately 65 per cent. of the total bones in the carcass of beef cattle is estimated by the U.S. Department of Agriculture as usable packer bone, the remainder being passed on with the delivery of fresh meat. Annual consumption of bones by manufacturers of glue and gelatin, fertiliser, and animal feeds is estimated at between five and six hundred thousand tons."—*U.S. Department of Commerce.*

* * *

Food Ministry Staff Training

The Ministry of Food has its own school at Colwyn Bay for training staff when they are appointed. The ages of the scholars range from 16 to 65 and include all kinds of people—retired business men, professional men of the officer class, school teachers, women who have been bus conductresses, and domestic servants.

When the Ministry of Food was started on September 3, 1939, there were 350 people who had been engaged on the preparation of war plans. In addition, two or three thousand people had been earmarked to come to the help of the Ministry when war came. These were the nucleus of the organisation as it exists today. Of necessity many of them went in with little knowledge of how the work of a Government Department has to be carried on. As the operations of the Ministry have extended and the staff increased, it has been found necessary to arrange for people as they entered the Ministry to be trained. In addition, those who had been in the Ministry for some time attended the school. In less than a year over 900 people have passed through the school. Among the courses open to students are secretarial, possible candidates for higher promotion, Food Mission in Washington, planning of imports, shipments, food storage, and how rationing works. Each subject is given by a person who is an expert. By means of this training the Ministry have a better knowledge as to what department these people are best suited for. This makes for the better working of the Ministry and consequently reacts to the benefit of the consuming public.

Dried Tomatoes

Mr. Mabane, Parliamentary Secretary, Ministry of Food, told Major Lyons (Con., Leicester E.) in the Commons that he was informed that two firms in the U.S. were undertaking the dehydration of tomato flakes.

Major Lyons had asked if he would consider setting up a similar plant in this country, and Mr. Mabane said that Lord Woolton did not see his way to provide plant and manpower in view of the requirements for drying other vegetables.

* * *

New Zoning Scheme for the Biscuit Industry

In order to secure further transport economies and a consequent saving of petrol, vehicles, manpower and rail haulage in the distribution of biscuits, a new zoning scheme has been prepared by the Cake and Biscuit Manufacturers' War-Time Alliance, Ltd. This scheme has received the approval of the Ministry of Food and came into operation on June 28, 1943.

The new plan is in effect an intensification of the original zoning scheme which has governed distribution in the industry since July, 1942, and it is expected that the combined schemes will reduce the ton-mileage required to transport these products to less than one quarter of its former total. The second scheme alone is estimated to result in a saving of many million ton-miles per year, a most valuable contribution towards the solution of transport problems.

The geographical unit in the new plan will continue to be the Divisional Food Area, and in delimiting the distributive area (which may consist of one or more Divisional Food Areas) for each factory, the principle has been accepted that no area with a surplus of biscuit production will "import" biscuits, and no area with a deficiency in production will "export" to other zones.

Deficiency areas will, however, draw their supplementary supplies from adjacent localities.

Wholesalers and retailers who are affected by the changes involved are being notified by their manufacturers as to the new source of supply from which their biscuits will be obtained.

Bakery Man's Double Honour

Lieut.-Colonel Alastair Stevenson Pearson, of the Army Air Corps, who was well known in Glasgow trade circles before joining up, and whose award of the D.S.O. for gallant and distinguished service in North Africa was announced on May 4, has now won a bar to that decoration.

Lieut.-Colonel Pearson is a nephew of Colonel W. D. Scott, Divisional Food Officer, West of Scotland Division, Ministry of Food, and has been associated with Colonel Scott's firm of W. D. Scott, Ltd., since he left school. He is managing director of the associated company Northern Bakeries, Glasgow.

* * *

Institute of Fuel Awards

The outstanding work done for the gas industry over a period of more than thirty years by Dr. E. W. Smith, C.B.E., the President Elect of the Institute of Fuel, was recognised by the Institution of Gas Engineers at their eightieth annual general meeting, when the Birmingham Medal was presented to him before a large audience in the Great Hall of the Civil Engineers.

The Birmingham Medal, the premier award of the gas industry, was founded some sixty years ago, and has only been presented on fourteen previous occasions during that period. In making the award the President referred not only to the great advances made by the industry with which Dr. Smith had been intimately connected in his professional capacity, but particularly to the outstanding results achieved by him and his staff in maintaining adequate gas supplies throughout Great Britain, so essential for the war effort, since he was appointed by Sir Andrew Duncan, President of the Board of Trade, as Director-General of Gas Supply. Such results, two years ago, were thought to be impossible of attainment.

It has been decided that the Melchett Medal, which is awarded annually by the Institute of Fuel, shall be presented this year to Dr. E. S. Grumell, C.B.E., Dr.-ès-Sc., M.I.Min.E., F.Inst.F.

This medal is the highest award in the gift of the Institute of Fuel and is being presented to Dr. Grumell in recognition of the outstanding work tending to the economical use of fuel which he has done over a long period.

Dr. Grumell has for many years been head of the coal research laboratories of the Imperial Chemical Industries, Ltd., and the research and experimental work carried out by him, having been published for the benefit of the community as well as for that of his company, has resulted in improving the design of many combustion appliances and, consequently, in the saving of large quantities of fuel.

* * *

Captain A. R. Cumming

Captain A. R. Cumming, F.C.S., informs us that he has severed, from July 1, his connexion with Cumming Parsons, Ltd., Manchester. He founded Cumming Bros., Glasgow, a quarter of a century ago, and was joint managing director of Cumming Parsons, Ltd., since 1936. He wishes us to express on his behalf his appreciation of the loyal support given him by his friends in the trade and also his staff for their helpful co-operation. Thanks are also due to the raw material suppliers who have helped during these difficult days. The goodwill and friendly rivalry of competitors in the industry has always been appreciated. His address is now Woodside House, Blairmore, Argyll, where he will welcome any of his business friends at any time.

* * *

Native Chiefs Assure Britain's Food

Lord Woolton, Minister of Food, recently told this story in London:

> I told my colleague, Lord Swinton, the Minister in West Africa, that for our security in twelve months' time we needed more ground nuts—the nuts from which we made margarine. He called together the native chiefs.
>
> They assembled, in ceremonial state, to listen to an important message of appeal. He told them of our need, and their opportunity to serve us.
>
> They held solemn conclave, discussed the problem, and then gave him a message of assurance. You have the word of the native chiefs of West Africa that your needs will be met.

Emphasis is given to this example of Empire collaboration by the illustration, which shows ground nuts being discharged in bulk.

In these days of war when "quick turn-round" is the first requirement, an innovation in the Port of London has been tried recently with success. Several cargoes containing bulk parcels of these nuts have been discharged by the suction elevators; and somewhat to the surprise of those concerned good despatch has been achieved. Very little hindrance has been caused through the accumulation of fluff, it being necessary only occasionally to clean out the dust-cyclones. In fact, the high rate of 105 tons per hour per machine was achieved in handling a parcel of 2,379 tons of kernels. Included in one cargo were 407 tons of ground nuts—"monkey nuts" to schoolboy epicures—and these were dealt with in five hours. —*P.L.A.*

Ground nuts being distributed in bulk by suction elevators. This innovation has been tried in the Port of London with success recently. The high rate of 105 tons per hour per machine was achieved.

Courtesy *P.L.A.*

Medicinal Honey

Medicinal honey produced by bees fed on artificial honey made from the sap of green vine leaves is being used with great success in Soviet hospitals, says the Soviet War News. It contains large quantities of vitamin B. The product was discovered by Katagan, a beekeeper and lecturer at the Erivan scientific institute (Soviet Armenia).—*Reuter.*

* * *

Cleansing of Dairy Equipment

The cleanliness of equipment and utensils is a vital factor in the production of milk of good keeping quality, and the most effective and simple method of ensuring cleanliness is by steam sterilisation. Owing to supply difficulties, however, any considerable extension of the use of steam for sterilising dairy equipment is impracticable, and the Minister of Health has decided, after considering representations made to him by the Ministry of Agriculture and Fisheries, to modify the prohibition contained in Article 21 (ii) of the Milk and Dairies Order, 1926, regarding the use of oxidising and preservative agents in the cleansing of dairy equipment and utensils. The exception from this prohibition for mechanical milkers and similar appliances used in milking has also been modified.

The Milk and Dairies Regulations, 1943, giving effect to this arrangement have just been issued, and will come into operation forthwith as provisional regulations. Only solutions of sodium hypochlorite approved by the Ministry of Agriculture and Fisheries are permitted to be used for the purpose, and care should be taken to ensure that non-approved solutions are not used. Instructions for use will be issued with approved solutions at the time of sale.

Full information on the use of these solutions is also given in leaflets which will be issued within the next few days by the Ministry of Agriculture and Fisheries on "The Use of Hypochlorite Solution in War-Time" and "Milking Machines in War-Time", copies of which may be obtained on application to the County War Agricultural Executive Committee.

Dried Bananas

Colonel Stanley, replying to a question in the Commons, stated that in addition to the known methods of drying bananas, ripe and unripe, he understood that the newer technique of the dehydration of foodstuffs has also been applied to bananas with satisfactory results.

Whether bananas dried by this or any other means could be placed on the United Kingdom import programme was a matter to be determined in the light of competing claims of similar types of foodstuffs for the limited shipping space by the Ministry of Food.

* * *

New Food Administrator for America

President Roosevelt has accepted the resignation of Mr. Chester C. Davis as War Food Administrator and has appointed Mr. Marvin Jones as his successor.

Mr. Davis, in his letter of resignation, said he did not believe that President Roosevelt's subsidy programme could effectively control inflation unless it was "accompanied, as in England, by a current tax and savings programme that drains off excess buying power, and by tight control of food supply."—*Reuter.*

* * *

Dried and Condensed Milk

Owing to the fact that it has been represented to him that the requirements of the Public Health (Dried Milk) Regulations, 1923 and 1927, and the Public Health (Condensed Milk) Regulations, 1923 and 1927, relating to the labelling of dried skimmed and condensed milks are causing misunderstanding, and that some modification of the label is desirable, the Minister of Health has accordingly made the Public Health (Dried and Condensed Milk) Regulations, 1943, which came into operation on July 1, 1943.

The effect of these regulations is to permit the labels used in connexion with the sale of dried skimmed and condensed skimmed milks to bear the words "not to be used for babies" instead of the words "unfit for babies".

Uganda Now Grows Rye

Uganda, which has never before grown rye, hopes this year to grow sufficient to supply the needs of 7,000 Polish refugees now in the Protectorate. This follows the success of trial plots of rye, where the cereal was grown as an experiment.

* * *

Fish Supplies for Manchester

Lord Woolton, Minister of Food, recently received a deputation of Manchester Members of Parliament regarding the allocation of fish to the Manchester area. The deputation was introduced by the Rt. Hon. J. R. Clynes, and there were also present:

Mr. W. Rostron Duckworth, Mr. Joseph Henderson, Mr. E. A. Radford, Mr. Harry Thorneycroft, Mr. W. H. Oldfield, Mr. Mabane (Parliamentary Secretary to the Ministry of Food), Mr. Adamson (Director of Fish Supplies).

The deputation explained the dissatisfaction in Manchester and in the Manchester City Council which arose from the belief that the population of Manchester was not getting its fair share of the fish supplies available in this country.

Lord Woolton explained in detail the difficulties which the Ministry had to meet in its handling of fish, and, in particular, the problems which had been faced in the Fleetwood fish zone, which included Manchester. Lord Woolton agreed that Manchester had been receiving less than the per caput allowance of fish to which it would have been entitled on an arithmetical basis. He undertook that this deficiency would be corrected as soon as possible. The means by which it was to be corrected was unfortunately dependent on the outcome of certain negotiations which were about to begin and which he hoped would result in more landings of fish at Fleetwood. If that hope failed, however, other means would be found. Lord Woolton pointed out that the actual quantity of fish available in the Manchester area was bound to remain dependent on the size of the landings, but he would see that the present grounds for the complaint that Manchester was not receiving its fair share of the country's fish supplies were removed.

Nat. Fed. of Corn Trade Assns.

At the annual general meeting of the National Federation of Corn Trade Associations Mr. E. Redmayne Jones was re-elected chairman for the third successive year, and Mr. R. Tadman, a representative of the London Corn Trade Association, was elected vice-chairman.

* * *

Control of Black Aphis on Sugar Beet

In collaboration with the British Sugar Corporation, the British Sugar Beet Seed Producers' Association and the National Farmers' Union, arrangements have again been made whereby machines operated by Messrs. Pest Control, Ltd., will be available this season to deal with black aphis infestations.

The methods of control are: (1) machine dusting of fields by nicotine, which, carried out on a large scale, has resulted in a kill of about 95 per cent., and (2) gassing with vaporised nicotine by special high clearance tractors, which has achieved a mortality approaching 100 per cent. without appreciable damage to crops. Gassing is preferable where the foliage is much rolled or crinkled, or where a very rapid kill is required.

This service is intended primarily to safeguard crops of sugar beet seed and sugar beet from attack by this pest. Subject to this consideration, the machines will be available to deal with infested crops of other seeds, peas, beans, strawberries, and brussels sprouts, particularly in sugar-beet-growing areas.

Successful control requires correct scientific advice and accurate timing of treatment. A grower who observes black aphis on his crops is therefore asked immediately to inform his contracting seed merchant in the case of sugar beet seed or his fieldman in the case of sugar beet, so that the necessary arrangements for treatment can be made without delay. A grower of other crops that have become infested should get into touch with the advisory entomologist for his area or the executive officer of the County War Agricultural Executive Committee.

Blackplate for Bottle Caps

The use of blackplate for caps on bottles and jars for such foods as sauces and pickles causes the caps to become rusty very quickly, making it appear that retailers are selling old stock. This point was mentioned by the chairman of Holbrooks recently, when he pointed out that the use of blackplate is a wartime necessity, compelled on the industry by the authorities.

* * *

Mazoe Citrus Products, Ltd.

Mazoe Citrus Products, Limited, of Mazoe, Southern Rhodesia, call attention to their change of style and advise that, although, owing to the exceptionally high vitamin C content of the seven times concentrated orange juice produced by their factory at Mazoe, the Ministry of Food has decided to control this product at present, and to reserve the majority of the total output for medicinal purposes in the national interest, it is hoped that after the war it may become possible again to renew normal trading relations among fruit juice beverage manufacturers.

The sale of the output of the highest quality oil of sweet orange is at present equally controlled by the Ministry of Food, priority being given to manufacturing firms.

The sole sale and distribution of both these products remain as before in the hands of H. Rubeck in London.

* * *

Growing Land Army

At the end of May the Women's Land Army numbered 65,406 strong. Over 19,000 were in the direct employ of the County War Agricultural Executive Committees, and nearly 3,700 were engaged on forestry work. May showed a net increase of 3,626 in the total number employed. There are, however, still many vacancies to be filled.

* * *

Killing Cockroaches, etc.

Owing to the shortage of pyrethrum insecticides the Ministry of Food have recommended borax powder for use against beetles, cockroaches, etc. J. Manger and Son, Ltd., point out that an alternative to borax, which must be imported, is caustic soda, which is freely available in 1-lb. and 7-lb. tins and 1-cwt. drums, and is entirely produced in this country.

Obviously caustic soda cannot be applied in the same manner as pyrethrum powders or borax. The instructions are to sprinkle a little in a dish, to cover it completely with a thin layer, a piece of bread or meat being placed in the centre to attract the insects.

* * *

Factory Lighting

Electric light is so easily obtained that there is the danger of neglecting due care in its distribution—the advantage of quantity may overwhelm the sense of quality. Too much light may even cause serious reduction of visibility due to glare and excessive contrasts. The more light available the greater is the need of control to obtain the main object—good visibility. The illustration shows an excellent example of factory lighting, installed by the Benjamin Electric, Ltd., Industrial Lighting Specialists.

Control of Soya Flour

The Minister of Food has made a new Order controlling soya flour. This prevented the pre-packing of soya flour after June 30, 1943. Holders of stocks will, however, be granted adequate time to dispose of their holdings.

Soya flour will, in future, be used primarily by manufacturers, but in order to assist vegetarians, etc., a quantity of loose soya flour will in due course be available at a price not exceeding 5d. per lb. The soya flour referred to in this new Order must not be confused with low-fat soya products, which are sold solely for incorporation in pork and beef sausages and in pork and beef sausage meat.

After June 30, 1943, soya flour mixtures, the manufacture and pre-packing of which have been authorised by licences granted under the Soya Flour (Control and Maximum Prices) Order, 1942, was subject to the provisions of the manufactured and Pre-packed Foods (Control) Order, 1942, and new licences under the latter Order will be required by existing licence holders.

Wholesalers and retailers will have until August 24 to dispose of any soya flour mixtures which are not manufactured or pre-packed in accordance with such a licence.

* * *

Freezing of Fish

Enquiries have been made of the Ministry of Food by individual members of the fish trade about the Ministry's attitude towards firms who wish to freeze fish during the summer months and distribute it when supplies become shorter in the following winter. The Ministry is not averse to such action on the part of individual firms.

The eventual distribution of the frozen fish would be subject to the conditions laid down in any Distribution Order in force at the time and to any directions on the transport of such fish which may then be operative. The Ministry's liability for carriage charges incurred on the fish from the port of landing to the cold store and from the cold store to the final destination would be governed by the terms of such instructions as may be in force at the time when the movements take place.

"Liver Fishermen"

Fish-liver oil refining, through shortage of other fats, has become an extensive industry in Canada. Six new plants are now working, states the *Evening Standard*.

The oil is being exported to Britain, the United States, South America, Australia, China and the West Indies.

"Liver fishermen" specialise not only in cod and halibut, but take care of livers from dog fish and even sharks, devil fish and octopuses, if found in the net.

* * *

U.S.S.R. Food News

Over 100 new food factories will be opened this year in the eastern districts of the Soviet Union. Half of them will be put into operation in the next few months.

* * *

A new concentrated food, yeast protein, is being manufactured at a Moscow factory. This yeast contains 60 per cent. of protein, and it has a food value of 25,000 calories per kilogram. The product can be kept for 8 to 9 days under suitable conditions. It is being regularly supplied to Moscow restaurants, and is used in the preparation of many different dishes.

* * *

The production of concentrated foods in the U.S.S.R. has trebled during the war period. Many up-to-date new factories have been built for this purpose. Special concentrated foods, which require no cooking, have been produced in large quantities for the front. Among these, fish powder is very popular; it is very handy to transport, and 1 lb. of it is equivalent to 8 lbs. of fresh fish. National dishes in concentrated form are prepared in every Soviet Republic for its countrymen at the front. For example, pilaff concentrates and fruit chocolate are produced in Central Asia. Special dietetic concentrates are produced for wounded Red Army men undergoing treatment in hospitals. The Research Institute for Food Concentrates in Moscow is constantly devising new recipes. About 100 kinds of concentrated foods are being produced.—*Soviet Monitor.*

Paper from Potato Peelings

A method by which paper can be produced from potato peelings and bean pods has been evolved by an engineer from Soissons, says Vichy radio.—*Reuter.*

* * *

New Zealand Dehydrated Butter

Three plants for the production of dehydrated butter have been established in New Zealand at the request of the British Government. They can be in production within a few weeks if required, and have a capacity of 35,000 tons of dehydrated butter a year.—*Reuter.*

* * *

Australia Rations Butter

The butter ration is now 8 ozs. weekly for each person in Australia. "Britain must have all the butter Australia can spare," declared Senator Keane, Commonwealth Minister for Trade and Customs. "No Australian will complain about getting ½ lb. of butter weekly when Britain survives on a 2-oz. ration. The average consumption in Australia has been 10 ozs. weekly." Any increase in butter production will go to British consumers and will not be used to raise the Australian butter ration. The Australian allowance is as high as in any country where butter is rationed, and higher than in most.—*Reuter.*

* * *

More Australian Canned Meat for Britain

To provide greater quantities of canned meat for Britain and the services, one forequarter of each body of beef exceeding four hundred pounds, dressed weight, prepared for civilian consumption in the greater Brisbane area, is now diverted to the canneries. The Brisbane area treats half Queensland's meat output, which is itself 85 per cent. of the total Australian output. An order to this effect has been issued by the Federal Controller of Meat Supplies, Mr. John Tonkin. The order, similar to one in operation in New South Wales since May, does not apply to bull beef.—*Reuter.*

Locust Threat to Middle East Food Crops

This may be the peak year of the twelve-year locust cycle in the Middle East, and measures are being taken, stated Mr. R. G. Casey at a press conference of the Middle East Supply Council on June 19, to meet the threat. Government officials and experts of the Middle East anti-locust unit are to hold a conference.

A campaign against locust is the more important this year not only from the point of view of the general war situation but because a remarkable increase has taken place in the food cultivation of the countries of the Middle East. In Iran 1,600 acres of derelict land have been reclaimed for wheat and barley. Irrigation in southern Lebanon has brought 7,000 more acres under cultivation. The Sudan became self-supporting in wheat with an 18,000-ton record crop; and Ethiopia is raising rubber.

* * *

Non-Availability of Pyrethrum

Pyrethrum is in very short supply owing to the demands of the Services, and civilian requirements can only be met to a very limited extent. At the present time all stocks are frozen, and these are mainly in the hands of the usual distributors and firms engaged in pest control operations.

Arrangements are now being made for an equitable distribution of existing stocks among the food-producing and food-using industries. As soon as these have been completed the various trades will be notified.

Meantime, every effort should be made in all bakeries to maintain such conditions of cleanliness that vermin and pests are given the minimum facilities for harbourage.

While pyrethrum is not obtainable, borax powder may be used for purposes of eliminating beetles and cockroaches. This should be applied weekly to all places likely to harbour the pests after the bakehouse has been well cleaned down. For an average-sized bakehouse, 1 lb. of borax will be required weekly. Supplies of this may be obtained from yeast distributors, who have undertaken the distribution of it to all bakers.

OBITER DICTA

● Not price, but prejudice, is the reason why dried eggs are not more widely bought.—*"Birmingham Post."*

● When cucumbers are pickled they cease to be cucumbers.—*Mr. A. W. Cockburn, K.C., deputy chairman, at London Sessions recently.*

● Nowadays as much attention is paid to the cooking of vegetables as to the preparation of other dishes.—*Mr. Butler, in reply to a question in the House of Commons.*

● I shall not in future consider that a farmer-butcher who illegally slaughters cattle ought to be licensed. He will go out of business.—*Lord Woolton.*

● The British people do not need to be obsessed by worries about the American home front.—*Mr. Roy Howard, who controls Scripps Howards, in an interview with the "Evening Standard".*

● We shall not straighten our backs until the coming of that day when we can safely say with relief "God's in His Heaven, all's right with the world".—*Mr. R. S. Hudson, Minister of Agriculture, speaking on "Farm Sunday", July 4, 1943.*

● It looks as if a secret move to suppress "World of Plenty" is afoot. The public should demand its showing through their local cinema managers. It is entitled to a screening in every town in the land.—*Mr. P. L. Mannock in the "Daily Herald".*

● How often and completely has the Government in London turned a stone-deaf ear to the demands of Scottish fishermen for reasonable national and international conditions — with results we know.—*Mr. Neil M. Gunn, in the "Glasgow Daily Record and Mail."*

● The price of strawberries is controlled at 1s. 3½d. per lb. We impose heavy penalties on the would-be profiteer who reaches for an extra ½d. The price of houses is not controlled. The seller makes a profit of many hundred pounds (untaxed, by the way) because we leave him free to take selfish advantages of war-time conditions. Why this difference between strawberries and houses?—*Mr. L. L. Barnes, writing in "The Times".*

Vitamins in Rose Hips

Dr. Wokes and other workers at the Ovaltine Research Laboratories have pointed out (*Nature*, 1943, 1, 279) that the prominence now given to rose hips as a source of vitamin C has tended to obscure their value as a source of other vitamins. They have found that extracts from hips of *R. canina* and *dumetorum* had carotene contents equivalent to 6,000 to 10,000 i.u. of vitamin A per 100 gm.; the vitamin C content of the extract ranged from 1,300 to 1,500 mgm. per 100 gm.; independent workers found that vitamin P was present in the extract to the unexpected extent of 520 G.L. units per gm. Commenting on these results, the authors state that when the dry extracts were stored for six months the loss of vitamin C was negligible, whereas in rose hip syrup and blackcurrant purée stored for a similar time the loss has been as high as 50 per cent. They found that rose hips do not contain a significant amount of vitamin B_1.

* * *

National Flour

There is a general strengthening of the grists now being used for national flour. Millers have been instructed to increase their usage of Manitoban wheats as supplies of English wheat decrease. The increased percentages of Manitoban wheats in the grist will vary slightly according to the availability of English wheats. In all areas, however, there will be an increased quantity of Manitoban wheat and the proportion used will be on a gradually increasing scale until the end of July.

The percentage of diluents will be maintained at 10 per cent., and both oats and barley will be used in most areas, the proportion of oat products not exceeding 3 per cent. of the grist at any time.

The increase in the proportion of Manitoban wheat should greatly facilitate production during the warm summer months by producing flour with a greater fermentation tolerance.

The proportion of white flour now being mixed in national flour at the mills is a uniform 10 per cent. throughout England, Wales, Scotland and Northern Ireland.

Argentine Estates of Bovril, Ltd.

The thirty-fifth annual general meeting of the Argentine Estates of Bovril, Limited, was held recently in London.

The deputy chairman (Lord Luke) said the Estates began their career with half a million acres of land. They now farmed one and a half million acres.

The company's debentures, amounting to £132,000, were due for redemption on July 1, when debenture holders would receive their cheques. This redemption would relieve preference shareholders of any prior charge, but he added a word of caution about future profits. The payments by Bovril, Limited, shown in this year's accounts in respect of cancellation of agreements, were final. No credit would appear next year under this heading.

The preference dividend had been paid up to date of accounts now submitted. A dividend of 3 per cent. on preferred ordinary shares was recommended. The year had been a difficult but successful one.

* * *

Hovis, Ltd.

The forty-fifth ordinary general meeting of Hovis, Limited, was held in London.

The following is an extract from the statement by the chairman, Mr. A. H. Dence, J.P., circulated to the shareholders:

Once again I have no accounts to place before you. I refer you to the remarks I made last year on the subject.

The special figures required before the remuneration due to us can be arrived at are being got on with as speedily and efficiently as possible. We can make no promises or forecasts for the future, and can only express the hope that when we meet you next year we shall have something more concrete to place before you. Meantime we—as millers—will continue to do our utmost to further the war effort, to work in loyal harmony with the Ministry that controls us, and to keep the Hovis flag flying.

The prudent and careful policy of your directors in past years, a policy which has been approved and endorsed by the shareholders year by year, helps us to-day. We are satisfied that our financial resources are sufficient again to justify us in recommending the payment of a dividend on the Ordinary shares for the half-year ended March 31, 1943, at the same rate as last year—namely, at the rate of 20 per cent. per annum.

* * *

The London Chamber of Commerce (Inc.)

At a recent meeting of the Council of the London Chamber of Commerce Lieut.-Colonel G. R. Harding, D.S.O., and Mr. J. McLean were re-elected Chairman and Deputy-Chairman of the Council respectively, and Mr. C. Douglas Scriven was re-elected Treasurer of the Chamber, for the ensuing year.

Colonel Harding is President of the Food Manufacturers' Federation; Mr. McLean is a director of Messrs. George Wills and Sons, Ltd., and Messrs. Fowlie, Reid and Wills, Ltd. (shipping merchants); and Mr. Scriven is senior partner Messrs. Scriven Bros. and Co. (hide, skin and leather merchants).

* * *

G. Hopkins and Sons

The annual general meeting of G. Hopkins and Sons, Limited, was held recently. In the course of his statement, Mr. Arthur Johnson said: The trading profit has improved: the charges for war risks insurance, depreciation, and interest are all lower than the comparable figures for 1941, and I think it is worthy of mention that the profit of £19,484, carried to the profit and loss appropriation account, is the highest profit carried in any year since the company's formation.

On the debit side of the profit and loss appropriation account we have the provision for taxation (£11,500), the dividends paid during the year on the 6 per cent. Cumulative Preference shares for the period from July 1, 1940, to December 31, 1942 (£4,875), and the provision for the proposed dividend on the Ordinary shares (£2,500), leaving a carry-forward of £6,133.

The payment of a dividend of 10 per cent. on the Ordinary shares is recommended.

New Russian Fruit

The Russians have evolved a new type of fruit which looks like a pear, tastes like a tangerine, and has the added tang of a lemon. The new fruit, produced by the Soviet Research Centre for Tropical and Southern Fruits, is claimed to be both hardy and prolific. The fruit ripens in November.—*Reuter.*

* * *

Wafer Makers Dump the Market

Manufacturers of wafer biscuits in Scotland, deprived of the ice-cream market, and lacking the chocolate which formerly was an essential part of their production processes, are now turning to the production and disposal of wafers—as wafers. Confectioners have been given fairly large quantities of these, in an effort to clear the accumulated stocks which were held by wafer makers.

Manufacture is still proceeding. The fact that these wafers are being sold free of points has made them a popular line.

* * *

Self-Lubricating Bearings

Modern machinery, with the increasing use of automatic operation, requires bearings of a suitable quality and design to ensure satisfactory lubrication during the complete operating cycle, and for prolonged periods of continuous service. "Oilite" oil retaining bronze bearings, manufactured by the Manganese Bronze and Brass Co., Ltd., are a development of the modern practice of powder metallurgy and their self-lubricating properties adequately fulfil these requirements, and more especially on food preparation machinery, where there must be no danger of oil leakage contaminating the product, for only a definite amount of lubricant is metered out by capillary and syphonic action to the surface, as the speed and load requires, and is reabsorbed upon reduction of load.

The bearings are in actual use on lightly loaded applications at speeds in excess of 20,000 r.p.m., while it has been approved for up to 3,000 lbs. per square inch for oscillating or limited motion.

Information and Advice

Rullespolse

8,500. *Required, a recipe for making rullespolse, a Danish dish, supposed to be made from mutton laps, salted, spiced, cooked and then pressed, usually made in the form of a flattened roly-poly, about 4 inches by 2½ inches by 6 inches.* (Hull.)

We suggest that you pickle the mutton for 48 hours in a 15 per cent. solution of salt in which has been dissolved 1½ ozs. of sodium nitrite per 10 gallons of solution. At the end of the pickling period the meat is drained and cooked in water until tender and the spice is added.

Doubtless you will know all about the pressing and the manipulation into a flattened roly-poly.

Approximately 300 lbs. of raw meat will give 200 lbs. of the finished product.

Canned Meal Galantine

8,771. *Required, a reference in the literature to the manufacture of canned meat galantine for export to tropical countries where the product would require to be kept in good condition for a minimum of two years.* (Scotland.)

We cannot trace any reference to the literature regarding the manufacture of canned meat galantine manufacture for export to tropical countries.

So far as keeping qualities are concerned, a properly sterilised pack of meat galantine should keep good in a tropical country.

The composition of a product destined for consumption in tropical countries would be somewhat different from that prepared for home consumption. A galantine with a large proportion of jelly would not have the necessary consistency in a very hot climate, but adjustment of the composition should not be difficult.

It is impossible to suggest any special formula without knowing the materials available, but we suggest that you make some trials and subject the cans of product to a temperature of 104° F. for about a month and then open them. This would not only give you an idea as to what the product would look like in a tropical country but would enable you to know that the contents were sterile. Incidentally, this is a very severe test, as in tropical towns at any rate ice is available and canned goods are usually chilled before opening. At the same time it is advisable to subject the pack to the most severe conditions.

The use of agar agar is indicated for tropical packs, although this substance is not available at the present time.

Soup Cubes

8,778. *Required, information on soup cubes.* (Eire.)

There are a large number of alternatives according to the class and price of cube which is required to be put on the market.

The constituents are mainly meat extract, soup stock, salt, flavourings, beef powder and cereal filler, the cheaper product containing fairly large quantities of the last item.

The manufacture of soup cubes necessitates the use of special plant for the actual making of the cubes and also wrapping machines. These are unobtainable at the present time and sundry enquiries for second-hand plant have not elicited any offers.

Information Supplied

8,705. *Information concerning the manufacture of potato crisps.* (Yorks.)

8,708. *Suppliers of can openers.* (London.)

8,709. *List of books concerned with jam and jelly manufacture, and also a good book on modern business methods.* (Glasgow.)

8,713. *Book giving a dictionary of all commodities handled in the grocery trade, their history, place of origin, qualities, etc.* (Lancs.)

8,716. *Pamphlets or other literature giving formulæ for the manufacture of custard powder.* (Ches.)

8,721. *Literature on the quick freezing of fruit.* (Eire.)

8,723. *Firms manufacturing marzipan and praline paste.* (London.)

8,731. *Manufacturers of a lifting device for hoisting barrels of fruit pulp—for the purpose of emptying same through bung, the height of the barrel required to be lifted being 4 to 6 feet.* (N. Ireland.)

8,735. *Manufacturers of a spray or other type drier for milk, and plant for producing dried yeast.* (Devon.)

8,741. *Suppliers of machinery for manufacture of potato crisps, and information on the manufacture.* (N. Ireland.)

8,750. *Suppliers of a prune stoning machine.* (London.)

8,751. *Makers of tableting machines suitable for preparing tablets from a powder, either hand or motor driven.* (Lancs.)

8,758. *Information on the manufacture of soya bean flour.* (London.)

8,759. *Formula for a fat extender.* (London.)

8,760. *Suppliers of ceresin linings sold separately.* (Derbyshire.)

8,764. *Manufacturers of modern ice cream.* (Eire.)

8,769. *Suppliers of automatic timing clocks for drawplate ovens, similar to those used in billiard halls.* (Staffs.)

8,773. *Actual or potential makers of banana flour.* (Surrey.)

8,775. *Storage of vegetables in brine.* (Worcs.)

8,780. *Information re Patent No. 541,119, "Improved method of preserving meat".* (London.)

8,781. *Suppliers of machinery suitable for producing tomato purée.* (London.)

Information Required

8,817. *Particulars concerning the manufacture of coffee extracts in powder form soluble in water.*

Recent Patents

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents", and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

Abstracts of Recent Specifications

Improvements in or relating to the Concentration of Fruit Juices by Evaporation

This invention relates to the treatment of fruit juices containing malic acid.

In one known method of treating apple juice with a view to producing apple treacle (*Chemistry and Industry*, Vol. LIX, No. 50, pp. 823-827, 1940) from sharp cooking apples (a type which is generally produced in excess of demands and is therefore available for the production of concentrates), the high acidity of the juice is neutralised by the addition of calcium carbonate and the juice subsequently concentrated under reduced pressure. This treatment provides a treacle which has a sweet flavour and also overcomes the necessity for the use of a pectin-decomposing enzyme.

Depending upon the degree of neutralisation calcium malate or calcium acid malate is formed, which, while removing the highly acid flavour, causes a distinct saline flavour in the treacle.

Under the usual conditions of vacuum evaporation calcium salts remain in solution. Attempts have been made to neutralise the natural acidity in the juice by some method which would result in a mutual precipitation without leaving any chemical salt in the solution, but all these attempts have been unsuccessful; nor could the crystalline salts of malic acid be precipitated from the solution so obtained by "seeding" or the like.

The invention is based upon the observation that if neutralised apple juice or other fluid juice containing malic acid which has been concentrated under pressures not substantially above 60 mm. of Hg and at temperatures not above 70° C. is substantially raised to temperatures above 70° C. a heavy crystalline precipitate of calcium salts of malic acid is formed, provided that the specific gravity of the juice has been brought to about 1·200 or more by the initial reduced pressure treatment. The calcium malate so prepared can be filtered or centrifuged off, washed free from the traces of apple treacle without appreciable loss of calcium salt, and from this by-product of the process the valuable 1-malic acid can be prepared in known manner—*e.g.*, by treatment with sulphuric acid.

The invention therefore consists in the process of treating fruit juices containing malic acid by neutralising the acid wholly or in part with calcium carbonate or milk of lime, either before or during concentration of the juice, concentrating the juice at temperatures below 70° C. under pressures not substantially above 60 mm. of mercury to a specific gravity of 1·200 or over, and then precipitating calcium malate or calcium acid malate by heating to 70° C. or above, filtering or centrifuging the concentrate.

The product may then if desired be concentrated by any convenient method either at reduced pressure or otherwise.

The invention is applicable to the treatment of apple juice and also other fruit juices containing malic acid, for instance plum juice, the procedure following precisely that described with reference to apple juice.

548,230. Vernon Leslie Smith Charley, Donald Percy Hopkins, and Alfred Pollard.

Specifications Published

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

549,885. CROWN CORK AND SEAL CO., INC.: Manufacture of caps for closures of containers.

549,903. BRITISH ARKADY CO., LTD., FORD, W. P., and MAIDEN, A. M.: Preparation of dough and bread.

549,931. OGILVIE FLOUR MILLS CO., LTD.: Recovery of tocopherol (vitamin E) and valuable by-products from vegetable oils.

549,997. FROSTED FOODS, LTD.: Methods of packaging and freezing flowable—*e.g.*, liquid or semi-liquid—food products.

550,010. ALFA-LAVAL CO., LTD., and CLARK, T. L.: Teat cups for mechanical milking equipment.

550,065. AMERICAN MACHINE AND FOUNDRY CO.: Wrapper-sealing mechanism for packaging machines.

550,066. AMERICAN MACHINE AND FOUNDRY CO.: Mechanism for closing the open tubular end of the wrapper of a package.

550,079. ENOCK, A. G., and GRAHAM-ENOCK MANUFACTURING CO., LTD.: Pasteurising apparatus for liquids.

Trade Marks

The list of trade marks of interest to readers has been selected from the "Official Trade Marks Journal" and is published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

BUFFINE.—621,195. Soup and soup powders. **Winstanley Supplies, Limited,** 04, Church Street, Enfield, Middlesex; Manufacturers.

SAMARITAN.—621,278. Edible oils and fats. **Thornton and Ross, Limited,** the Chemical Works, off Manchester Road, Linthwaite, near Huddersfield, Yorkshire; Manufacturing Chemists. To be associated with No. 461,440 (2480) xlii and another.

ENOLIT.—621,457. Flavourings (other than essential oils) for food. **Economic Utilities, Limited,** Westcombe House, 56-58, Whitcomb Street, London, W.C. 2; Merchants.

FURTEX.—621,466. Edible oils and fats. **Jack Osborne Higgins Furber,** trading as **John Furber and Co.,** 15, Norman Street, Lincoln; Manufacturer and Merchant.

New Companies

Rhoden Farms, Limited. (377691.) Rhoden Farm, Paddock Wood, Kent. Nom. cap.: £10,000 in £1 shares. Dir.: J. W. Thwaites, Crittenden, Matfield, Kent, and others to be apptd. by subs.

Neil Pound (Andover) Limited. (378513.) To take over a bus. of wholesale fruit and potato mcht. cd. on by Neil Pound. Nom. cap.: £4,000 in £1 shares. Ch. and permt. dir.: N. Pound, Redenham Orchards, nr. Andover, Hants. Sub.: Mrs. E. H. Pound, Redenham Orchards, nr. Andover, Hants.

Lumbs Commercial Hatchery, Limited. (378530.) To carry on bus. of poultry farmers, etc. Nom. cap.: £500 in £1 shares. Permt. dirs.: T. Lumb, "Dunluce", Fairfield, Hebden Bridge; E. Lumb, address not stated; D. G. Sutcliffe, "Delmar", Fairfield, Hebden Bridge.

Elliott Marris, Limited. (378540.) Balfour House, Finsbury Pavement, E.C. 2. To carry on bus. of wholesale and retail mchts., etc. Nom. cap.: £100 in £1 shares. Dirs.: G. E. Elliott, 32, Rivercourt, Portsmouth Road, Surbiton; R. W. H. Marris, 47, Manor Drive, Hinchley Wood, Surrey; L. V. Elliott, 183, Winchester Road, Highams Park, Essex.

Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C. 2.